ACCEPTABILITY AND FEASIBILITY OF A WATER SAFETY INTERVENTION FOR ADOLESCENTS AGED 14-19 YEARS

by

Wendy Lynn Ojeda

A Dissertation Submitted to the Faculty of the

COLLEGE OF NURSING

In Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY AND DOCTOR OF NURSING PRACTICE

In the Graduate College

THE UNIVERSITY OF ARIZONA

2019

THE UNIVERSITY OF ARIZONA
GRADUATE COLLEGE

As members of the Dissertation Committee, we certify that we have read the dissertation prepared by *Wendy Lynn Borgersen*, titled *Acceptability and Feasibility of a Water Safety Intervention for Adolescents Aged 14-19 Years* and recommend that it be accepted as fulfilling the dissertation requirement for the Degree of Doctor of Philosophy.

Terry A. Badger, PhD, RN, PMHCNS-BC, FAAN Date: April 2, 2019

Ida M. Moore, PhD, RN, FAAN Date: April 2, 2019

Gloanna J. Peek, PhD, RN, CPNP Date: April 2, 2019

Final approval and acceptance of this dissertation is contingent upon the candidate's submission of the final copies of the dissertation to the Graduate College.

I hereby certify that I have read this dissertation prepared under my direction and recommend that it be accepted as fulfilling the dissertation requirement.

Date: April 2, 2019
Dissertation Director: *Terry A. Badger, PhD, RN, PMHCNS-BC, FAAN*

ACKNOWLEDGMENTS

There are a core group of people without whom this thesis would not have been possible. First, I am indebted to my advisor and committee chair, Dr. Terry Badger, for her wisdom and guidance. Her patience and encouragement was always stronger than any temporary self-doubt. Dr. Badger was always the balanced endorsement of realism and support; held me accountable, set the bar high, and inspired my potential. I also cannot express enough gratitude to my other two committee members, Dr. Gloanna Peek and Dr. Ki Ida Moore. Dr. Peek has been my pillar for over a decade, mentoring my entire pediatric nursing career; from RN to advanced clinician, and finally, Nurse Scientist. Glo, thank you a million times over … I look up to you. I have so much gratitude for Dr. Moore's attention to detail and gentle nudges to inspire my awareness as a researcher. Her calm presence and knowledgeable input is invaluable, and I would not be the scientist I am today without her. I would also like to thank all faculty that I had the pleasure of working with during my studies.

I would like to extend profound appreciation to Daisy Mountain Fire Department. Not only did the department graciously provide their fire trucks and supplies to create the water safety video, multiple members volunteered their time for the video, implementation of the intervention, and participation in data collection. More specifically, I would like to devote the 'sincerest' thank you to firefighter Beau Borgersen for his unyielding efforts and support. Beau, this dissertation would not have been possible without you. I am thankful to Deer Valley Unified School District staff and Boulder Creek High School students for their participation and desire to encourage water safety.

Finally, I would like to thank my family, work colleagues that have become family, and my significant other, David. I love you all, and I am forever grateful for your encouragement. A special thank you to my son, Braden, who inspires my successes every day.

DEDICATION

I dedicate this dissertation to pediatric drowning victims and their families.

TABLE OF CONTENTS

LIST OF FIGURES 8

LIST OF TABLES 9

ABSTRACT 10

CHAPTER 1: INTRODUCTION 11

Study Aims 13
Background and Significance 13
Impact of Drowning 13
Impact of Drowning in Adolescents 14
Adolescent Cognitive and Social Development 15
Worldview and Philosophical Perspective 17
Theory 18
Social Cognitive Theory 18
Reciprocal determinism. 20
Behavioral capability. 20
Expectations. 20
Self-efficacy. 21
Observational learning. 21
Operant conditioning. 22
Hypothesized Intervention Theoretical Model 22
Conclusion 25

CHAPTER 2: REVIEW OF THE LITERATURE 27

Introduction 27
Water Safety Educational Interventions 31
Swimming Lessons 33
Understanding the Impact of Water Safety Interventions Among Children 38
Summary 39

CHAPTER 3: METHODOLOGY 40

Research Design 40
Sample and Recruitment 41
Setting 43
Human Subjects Protection 43
Intervention 46
Adolescent Development and Intervention Development 47
Cognitive Development 48
Psychosocial Development 49
Adolescents and Intervention Technology 50
Intervention Fidelity 50

TABLE OF CONTENTS – *Continued*

Intervention Content Validity 51
Instrumentation and Measures 52
Water Safety and Drowning Prevention Knowledge 52
Acceptability 54
Cost Description 55
Feasibility 56
Data Collection Procedure 57
Data Analysis 58
Summary 59

CHAPTER 4: RESULTS AND ANALYSIS 61

Student Sample 61
Test of Normality of Data of Study Variables 63
Aim 1: Effect of Adolescent-Targeted Water Safety Intervention on Student's Knowledge, Attitudes, and Behaviors of Safe Open Water Practices 63
Aim 2: Acceptability and Feasibility of an Adolescent Water Safety Education Intervention 73
Aim 3: Cost Analysis of Implementing an Adolescent-Based Open Water Safety Intervention 74
Summary 75

CHAPTER 5: DISCUSSION 76

Effects of Adolescent-Targeted Water Safety Intervention 77
Acceptability and Feasibility of Interventions 80
Implications of Findings 80
Individual 81
Family 81
Societal 81
Theory 81
Practice 83
DNP Essentials 84
Limitations of the Study 85
Recommendations for Future Research 86
Conclusion 87

APPENDIX A: THE UNIVERSITY OF ARIZONA INSTITUTIONAL REVIEW BOARD (IRB) APPROVAL LETTER 89
APPENDIX B: BOULDER CREEK HIGH SCHOOL LETTER OF SUPPORT 91
APPENDIX C: DAISY MOUNTAIN FIRE DEPARTMENT LETTER OF SUPPORT 93

TABLE OF CONTENTS – *Continued*

APPENDIX D: INFORMATIONAL LETTER 95
APPENDIX E: FIREFIGHTER/TEACHER INFORMED CONSENT FOR PARTICIPATION97
APPENDIX F: STUDENT INFORMED CONSENT FOR PARTICIPATION 101
APPENDIX G: PROMOTIONAL FLYER.....104
APPENDIX H: PARENTAL CONSENT FORM 106
APPENDIX I: STUDENT ASSENT FORM 110
APPENDIX J: WEB LINK TO PROMOTIONAL VIDEO 113
APPENDIX K: PROMOTIONAL VIDEO SCRIPT 115

REFERENCES 127

LIST OF FIGURES

FIGURE 1. Hypothesized social cognitive theory model. 23
FIGURE 2. Literature review. 30
FIGURE 3. Feasibility community-based design. 41
FIGURE 4. Footage from water safety intervention video filming. 47
FIGURE 5. Drowning risk among youth related to KAB theoretical model. 54
FIGURE 6. Technology acceptance model 55

LIST OF TABLES

TABLE 1. *Social cognitive theory concept definitions.* 19

TABLE 2. *In-person drowning interventions in children 6-19 years (included studies).* 36

TABLE 3. *Education segments for adolescent recreational water safety video.*.....47

TABLE 4. *Intervention fidelity.*.....57

TABLE 5. *Frequencies and percentages of demographic information of students (N = 26).*62

TABLE 6. *Frequencies and percentages of swimming background of students (N = 26).*.....62

TABLE 7. *Skewness and kurtosis statistics of study variables.* 63

TABLE 8. *Descriptive statistics summaries of knowledge, attitudes, and behaviors about water safety.*.....64

TABLE 9. *Results of independent sample t-test of differences of knowledge, attitudes, and behaviors about water safety.* 66

TABLE 10. *Frequency and percentage summaries of differences of recreational water frequency usage.*.....68

TABLE 11. *Results of chi-square test of differences of recreational water frequency usage.* .73

TABLE 12. *Firefighters' and teachers' perceived usefulness and perceived ease of use of an adolescent water safety education intervention.*.....74

ABSTRACT

This study examined the preliminary efficacy, acceptability, and cost of an adolescent water safety and drowning prevention intervention using a pre-experimental one-group pre-test post-test design. The sample included 26 students and one teacher at Boulder Creek High School, and 27 firefighters from Daisy Mountain Fire Department. The students were provided with pre- and post-surveys before and after a 20-minute water safety intervention video to evaluate efficacy of increased water safety knowledge. Firefighters and the teacher were provided post-intervention surveys to assess acceptability. Cost was calculated at the end of data collection. The findings showed that exposure to targeted water safety intervention tested in this study did not change students' knowledge about water safety. More specifically, the findings suggested there was much more to be discovered about what truly changes water safety beliefs for adolescents. There were positive perceptions of the feasibility, acceptability, and ease of use of an adolescent water safety program by the teacher and fire department.

CHAPTER 1: INTRODUCTION

Drowning is a leading cause of mortality in the pediatric population; claiming approximately 1077 lives of children and adolescents in the United States (U.S.) in 2006 alone (Wallis, Watt, Franklin, Taylor, Nixon, & Kimble, 2015). There are an estimated 175,000 deadly child drownings per year worldwide, highlighting this global public health issue (Wallis, Watt, Franklin, Taylor, Nixon, & Kimble, 2015). It is often overlooked by society that the risk of drowning increases substantially at age 15 (CDC, 2016). A recent systematic literature review assessing interventions for drowning prevention, stressed a worldwide deficiency in drowning interventions for older children and adolescents (Wallis, Watt, Franklin, Taylor, Nixon, & Kimble, 2015). In fact, the authors were only able to identify one study with a target age group beyond 14 years of age.

The American Academy of Pediatrics (AAP) reports that an annual average of 312 U.S. unintentional drownings are aged 15 to 19 years (Weiss, 2010). Weiss (2010) reports that an alarming 69% of adolescent and young adult victims, 15 to 19 years, drown in fresh bodies of water. A report provided by the Centers for Disease Control and Prevention (CDC) corroborates that open water settings are of high concern for pediatric drowning, in which they found it to be three times the rate of swimming pool drownings in 2007 (CDC, 2012).

Maricopa County, encompassing the Phoenix Metro area, has 15 reservoirs and lakes with a subsequent 13 drowning victims in 2013 (Arizona Department of Health Services, 2014). Six of these fatal drownings consisted of victims aged 15 to 34 years, whereas one victim was between the ages of 0 to 14 years (Arizona Department of Health Services, 2014). The AAP attributes drowning as a leading cause of injury-related death in children, approximately more

than 1400 children younger than 20 in the U.S. annually (Brenner, 2003). In addition, the AAP estimates that there are '1 to 4' nonfatal near drowning events for every single drowning death, with more than half of the survivors suffering permanent neurologic impairment (2003). Petrass and Blitvich (2014) emphasize a lack in research surrounding drowning risk and mediations among adolescents and young adults. The empirical evidence regarding adolescent drowning risk factors is well established and includes: alcohol and drug use, risk-taking behaviors, and swimming ability (Petrass & Blitvich, 2014). In order to reduce risk factors, education must be provided addressing these risk factors. This will reduce mortality by changing attitudes and level of knowledge (Weiss, 2010).

Little is known about adolescent targeted drowning interventions. A small number of communities have demonstrated successful adolescent and young adult water safety interventions (Bennett, Cummings, Quan, & Lewis, 1999; Carl, Leo, & Cox, 2001). A majority of these very rare studies examined the intervention impact on multiple pediatric age groups, including adolescents, yet lacked an adolescent specific driven intervention. Further, these interventions were not implemented in the U.S. even though multiple studies identified the great need in U.S. territories such as Wisconsin, Washington, and New York (Bennett, Cummings, Quan, & Lewis, 1999; Carl, Leo, & Cox, 2001; Wallis, Watt, Franklin, Taylor, Nixon, & Kimble, 2015). Supplementary studies investigated adolescent drowning risk factors, prevalence, and potential interventions (Carl, Leo, & Cox, 2001). These studies lack data that demonstrate the interventions were feasible and/or successful in reducing adolescent drowning mortality. As a result, there is a lack of evidence for effective ways of addressing adolescent water drowning.

There is much evidence to suggest that an adolescent recreational open body water unintentional drowning is a national and Arizona-specific problem. The data from Arizona Department of Health Services, CDC, and The American Academy of Pediatrics provides insight regarding the proposed intervention's great need and potential among the given community setting and target population. Systematic article reviews emphasize the lacking clarification and scope of: 1) drowning among older children and adolescents; and, 2) open-water drowning. Focusing on the reduction of open water drowning has enormous economic influence, along with devastating emotional and physical impact on the victims, their families, and community. Findings from this study will provide empirical evidence that a community-based water safety intervention is feasible among high school students and corresponding stakeholders.

Study Aims

The specific aims for this study are:

Aim 1. Determine the preliminary efficacy of an adolescent-targeted water safety intervention on student's knowledge of safe open water practices.

Aim 2. Determine the acceptability and feasibility of the intervention among firefighters and teachers delivering the intervention.

Aim 3. Describe the process and cost of creating and implementing an adolescent-based open-water safety intervention.

Background and Significance

Impact of Drowning

Approximately 10 people per day die from unintentional drowning nationwide (CDC, 2016). Some 52% of these drownings occur in recreational open bodies of water, nearly three

times the number of swimming pool drownings (CDC, 2012). The Arizona Department of Health Services (2014) found Arizona's age-adjusted drowning mortality rate was 25% higher than the national rate from 2006 to 2010. Of these deaths, 24% of Arizona's fatal drowning deaths were attributed to open water drowning (Arizona Department of Health Services, 2014). The CDC calculated an impact of 1.1% (8937 years), of potential life years lost from unintentional drowning deaths in Arizona. Arizona Department of Health Services (2014) predicts that one drowning related death can cost a community an alarming $324,449 - $535,379. Additionally, a non-fatal drowning could cost the victim approximately $250,000 per year, and a lifetime cost of $5.5 million for long-term care typically related to neurological deficits (Arizona Department of Health Services, 2014).

Impact of Drowning in Adolescents

Several studies have documented highest drowning rates among children and adolescents (Weiss, 2010; Wallis et al., 2015b). Unintentional drowning is the fifth leading cause of death among people of all ages, yet is the second leading cause of death for children and adolescents (CDC, 2012). The CDC (2012) specifies that a majority of drowning events in those over 15 years of age occur in open water settings such as rivers and lakes. Some 69% of adolescent drownings aged 15 to 19 years occur in recreational open bodies of water (Weiss, 2010). Adolescent males are 10 times more likely to drown than females. In 2006 there were 312 unintentional drowning deaths in adolescents aged 15 to 19 years nationwide, in which 282 were male and 30 were female (Weis, 2010). The risk for drowning in open bodies of water increases substantially for both sexes at age 15 (CDC, 2012).

The AAP found national influence of adolescent drowning related to alcohol, lapse in supervision, boating, underlying medical conditions, swimming ability, personal flotation device use, and CPR training (Weiss, 2010). Phoenix Children's Hospital (PCH) water safety counsel recognizes Arizona teens at high risk, statistically established with an above-average rate of drowning related to: 1) risky behaviors (alcohol, drugs, peer influence, etc.); 2) public and close proximity of recreational water areas with consumers (which vary in boating and swimming experience levels); 3) extreme climate and heat; and, 4) lack of life jacket use (Balint, 2011). Yet, the idea of an intervention here is novel in concept.

Adolescent Cognitive and Social Development

The multiple cognitive and psychosocial stages unique to the pediatric population have made creating a universal all-ages pediatric water safety intervention difficult (Weiss, 2010). Exclusive needs and developmental stages throughout the pediatric years should be taken into account when attempting to develop educational programs and interventions for drowning prevention. Multiple intervention studies addressing infant, toddler, and preschool developmental stages have been presented leading to cognitive appropriate education, and more specifically parental implemented water barriers to prevent drowning (Weiss, 2010). Drowning deaths in younger children has dropped significantly since 1985 when barriers, parental supervision, and parental education were utilized to target the infant, toddler, and preschool ages (Weiss, 2010). However, these strategies have not proven to be effective in the adolescent population because the adolescent population is exclusive in the location of drowning as discussed previously, and their cognitive and psychosocial development.

The cognitive development of adolescents is in a transition from concrete to abstract thinking, providing them the ability to envision concepts that they have not seen or experienced (Sanders, 2013). This cognitive development in adolescents enables their ability to analyze situations and assess hypothetical situations for their future outcomes and decision making (Piaget, 1952). Concrete thinking tendencies and egocentrism of adolescents enables more risk taking behaviors, yet also provides the ability to influence via adult interaction, peer interaction, and social influence (Sanders, 2013). The adolescent's formal operational thinking can be utilized in water safety educational delivery utilizing peer influence to present concepts that they have not experienced related to potential consequences or unintentional drowning related to recreational water risky behaviors.

The adolescent psychosocial development consists of identity. Erikson referred to adolescence as the stage of identity versus role confusion where autonomy and future direction are established (Sanders, 2013). Autonomy and identity in adolescents is typically driven by the preoccupation of how they are perceived by their peers with great social persuasion in identification separately from their parents (Sanders, 2013). The adolescent psychosocial stage is best influenced with methods that the adolescent can relate their experience to others and establish their own values.

If the results from the study support that an adolescent water safety intervention is successful in improving adolescent participant water safety knowledge, is acceptable among stakeholders, and is cost effective for future community implementation; the intervention has long-term potential for implementation and dissemination beyond Arizona. Not only is an adolescent water safety intervention needed in Arizona, but nationally and worldwide. The

adolescent specific psychological and cognitive-based constructs utilized in the study framework, will allow findings to be generalized and expanded to all adolescents beyond the adolescents who participated in this study. Additionally, positive findings can provide the structure for a successful worldwide adolescent water safety intervention dissemination, adapted to different communities (e.g., language).

Worldview and Philosophical Perspective

A philosophical worldview is an individualized process of attaining knowledge and understanding phenomena, guided by one's perspective of reality (Prasad, 2005). An individual's health veracity is driven through subjective experiences, in which the person forms their own perceptions and knowledge. This type of worldview and philosophical perspective is referred to as constructivism (Borgersen, 2015; Polit & Tatano Beck, 2014).

Piaget (1952) describes the process of changing one's own reality and forming subjective experiences into concepts as schemata (Borgersen, 2015). Constructivism worldview seeks to understand phenomena by appreciating subjective meaning, the learner or participant's process of developing their own schemata (Borgersen, 2015; Piaget, 1952). Constructivism worldview has a large influence on subjective perspective from human-environment interaction and social interactions (Polit & Tatano Beck, 2014). The aforementioned constructs associated with constructivism have resonated in my theoretical application in approaching my area of interest.

Utilizing a constructivist view is rational for investigating application of an educational and social influencing intervention among adolescents to reduce drowning in open bodies of water. Throughout my theory development, I found that constructivism delivered the

groundwork for my intervention, ultimately leading to my constructivism-based driving theory of choice.

Theory

Nursing theory is a systematic method of conceptualizing aspects of reality and forming relationships of phenomena related to nursing (Meleis, 2007). The section below describes and evaluates social cognitive theory (Table 1), its relevance to my proposed intervention, and my hypothesized theoretical model (Figure 1).

Social Cognitive Theory

Social cognitive theory (SCT) is a behavioral interpersonal theory utilized to focus on self-efficacy and self-regulation of behavior by way of interventions that prepare the individual's skills, attitudes, and self-beliefs with emphasis on social influence and learning (Bandura, 1989; Borgersen, 2015, 2014). The underlying social constructivism paradigm in the theory provides a view of how social influence and learning impacts schemata and outcome behaviors (Bandura, 1989; Bandura, 2004; Piaget, 1952; Borgersen, 2015). SCT (Table 1) involves interpretability of concepts that are manipulated with an intervention to bring forth knowledge attainment and behavioral change, and includes: 1) reciprocal determinism; 2) behavioral capability; 3) expectations; 4) self-efficacy; 5) observational learning; and, 6) operant conditioning (Fisher & Fisher, 2000; Bandura, 2004, 1989; Borgersen, 2015).

The structure of the theory consists of main concepts and subconstructs, which allow the analyst to further explore the underlying social and personal influences on human functioning and behavior (Bandura, 1989; Borgersen, 2015). Fisher and Fisher (2000) place the construct of

knowledge and socially influenced self-efficacy as the foundation of SCT, and is the main method to alter behaviors of health promotion.

TABLE 1. *Social cognitive theory concept definitions.*

Construct	Definition
Reciprocal Determinism	A triadic reciprocity of an individual's behavior affecting and being affected by unique factors (i.e., cognitive, experiences, consequences, expectations, knowledge, etc.) and social environment (Bandura, 1989).
Behavioral Capability	The fundamental knowledge and skills needed to perform a specified behavior (Bandura, 2004).
Construct	Definition
Expectations	Individual beliefs regarding potential outcomes based on self-efficacy, cognitions, and behavior (Simons-Morton, McLeroy, & Wendel, 2012).
Self-efficacy	"Self-efficacy is the sense that one can control his or her motivation and environment, and especially his or her behavior." (Fisher & Fisher, 2000, pp. 24). An individual's personal beliefs to carry out a goal oriented behavior (Bandura, 1989).
Observational Learning	Learning, changing attitudes, and forming beliefs through observation of how carried out behavior is reinforced through vicarious reinforcement and modeling (Simons-Morton, McLeroy, & Wendel, 2012). • Vicarious Reinforcement - interpretation of stimuli in observation to anticipate reinforcement (Fisher & Fisher, 2000). • Modeling - social influence observation to affect social norm acceptance, perception, and behavior (Simons-Morton, McLeroy, & Wendel, 2012).
Operant Conditioning	Positive consequences or reactions that are more likely to encourage health promotion behavior (Fisher & Fisher, 2000).

SCT constructs resonate with the concept of community-based participatory research - utilizing society to improve water safety knowledge among the community's target population in a method that is both acceptable and cost effective. Evaluation of the intervention's feasibility within the community will provide strong support for further randomized controlled trials related to SCT's main concept of self-efficacy, improving autonomy in making knowledgeable and safer decisions, and ultimately changing self-behaviors. SCT possess both a psychoanalytic perspective to substantiate the intervention's feasibility, while approaching behavioral capability and behavior change in future large scale research, giving me the best fit of coherent set of concepts that explain and predict good evidence in my area of research.

Reciprocal determinism. This component of SCT exhibits triadic reciprocity of individual, environment, and behavior (Bandura, 1989). Negative and positive reinforcement determined from motivation, action behaviors, impediments, opportunities, and consequences cycle through a feedback loop based on unique responses of the individual. Individual pre-existing knowledge and experiences affect motivation and behaviors. The individual's environment, exaggerated by social impediments, opportunities, and negative/positive reinforcements, cause a response in behavior (Bandura, 2004). Therefore, the three components interrelate based on unique responses of the individual. Reciprocal determinism links person, environment, and behavior.

Behavioral capability. The construct of behavioral capability depicts the relationship of knowledge, skills, motivation, and behavior required to perform specified behavior (Bandura, 2004). Positive reinforcement of the health promotion increases motivation and desired behavior (Bandura, 2004). The consequence and ending result may either reinforce the health promotion, leading to increased motivation and chance of expressed behavior, or the opposite is likely possible if the individual lacks knowledge and skills, particularly related to negative prior experiences (Bandura, 2004). The individual's motivation is either promoted or hindered based on previous knowledge and experience. The adolescent education intervention will enable participants to increase personal motivation and skill to fulfill safe open water safety practices, increasing knowledge, and tentatively reducing drowning mortality among adolescents.

Expectations. Expectancies regarding self-efficacy and outcomes address cognitions related to behavior including beliefs, attitudes, self-reliance, and reinforcement (Simons-Morton, McLeroy, & Wendel, 2012; Bandura, 2004). Bandura (2004), states that motivation is increased

from an individual's expectation of positive reinforcement, changing beliefs and attitudes to favor behavior of the intervention. Changing beliefs and attitudes regarding self-regulation and self-efficacy with knowledge, skills, and positive reinforcement, increases confidence in outcomes (Bandura, 2004). Therefore, motivation to fulfill the health promotion behavior is increased from an individual expectation of positive reinforcement. Hence, the water safety education intervention will use modeling and reinforcement to strengthen beliefs and self-reliance of performing open water activities safely.

Self-efficacy. Bandura (1989) relates an individual's personal beliefs, perceptions, and capability to carry out a goal-oriented behavior. Self-efficacy is the central SCT construct within the water safety intervention as a method to increase autonomy in water safety practices. It is of utmost importance to create positive reinforcement, constructive experiences, and adequate knowledge for skill development. Positive reinforcement and educational information provided through fire department personnel and peers will increase motivation, provide knowledge, and expand skills in carrying out water safety. As a result, educational activities and social support provided through the intervention will increase capability, self-perception, and probability of behavior (Bandura, 1989; Fisher & Fisher, 2000).

Observational learning. The concept of observational learning utilizes indirect social influence, modeling, and reinforcement as a catalyst for anticipated reinforcement, outcome expectations, and behavior influence (Bandura, 2004; Fisher & Fisher, 2000). As stated in the previous constructs, social influence and reinforcement of water safety will be accomplished via modeling.

Operant conditioning. Fisher and Fisher (2000) define operant conditioning as positive consequences that encourage health promotion behavior. This concept superimposes with most of the other constructs within SCT connecting expectation, reinforcement, observational learning, and expressed behavior. Ensuring that the intervention gives positive reinforced expectations and feedback will increase the likelihood that the adolescents will perform safe water practices.

Hypothesized Intervention Theoretical Model

SCT framework processes abstract concepts from triadic reciprocity (Figure 1) into concrete constructs; reciprocal determinism, behavioral capability, expectations, self-efficacy, observational learning, and operant conditioning. Bandura (1989) has theorized and proven that influence on the following triad of concepts, allows one to gain an understanding of how human behavior is influenced and predicted. The open-water safety intervention for adolescents was intended to impact participants' knowledge attainment via community stakeholders through education and social influence. It was hypothesized that utilizing SCT constructs in the intervention would provide the framework for a feasible solution to address adolescent drowning in open bodies of water. Therefore, providing a water safety education intervention would increase knowledge necessary to alter risky behaviors that otherwise attribute to high adolescent drowning rates in open bodies of water.

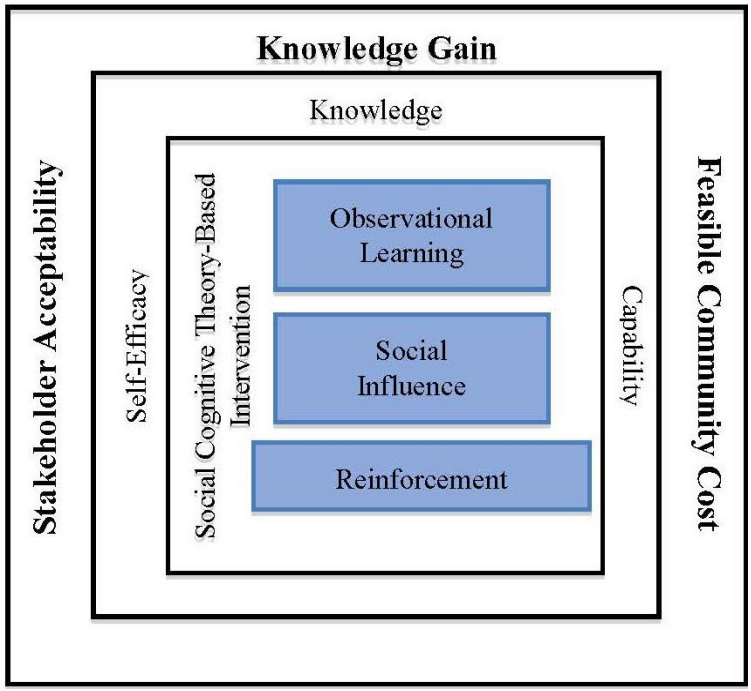

FIGURE 1. Hypothesized social cognitive theory model.

SCT reciprocal determinism gives a broad understanding of relationships between the individual, environment, and behavior (Simon-Mortin, McLeroy, & Wendel, 2012). Individual knowledge regarding health, benefits, and outcomes set the stage for motivation and action behaviors (Bandura, 2004). In this feedback loop, an individual's environment with social impediments, opportunities, and consequences relate to knowledge and predict behavior through negative and positive reinforcement (Bandura, 2004).

The environmental realm also included sociocultural factors, facilitators, and impediments, which causes response in behavior from the individual. Influence of this triadic notion requires an impact on subconstructs within SCT – behavioral capability, expectations, self-efficacy, observational learning, and reinforcement. Behavioral capability is the behavior and knowledge needed to perform a specified behavior (Bandura, 2004). Providing water-safety

information expands personal knowledge and capability to carry out safer behaviors on open-bodies of water.

Expectations relate to prospective self-efficacy and outcomes that address awareness related to behavior through an intervention that is able to change beliefs, attitudes, and knowledge to favor a behavior change (Bandura, 2004; Simons-Morton, McLeroy, & Wendel, 2012). Self-efficacy is the central construct of the triadic interactions that interrelates individual perceptions, capability, and behavior (Fisher & Fisher, 2000). Previously discussed educational information and building of self-knowledge provides participants the ability to be autonomous in carrying out safe behaviors on water, reducing drowning morbidity and mortality. Observational learning bases social influence and reinforcement for changing behavior (Bandura, 2004). This water safety program utilized modeling through peers and fire department personnel. Reinforcement is the subconstruct that positive consequences or reactions may encourage behavior, whereas negative consequence may cause avoidance of a specified behavior (Fisher & Fisher, 2000). A short video utilizing peers who have had negative experiences with a friend or loved one who drown, provided negative feedback, and discouraged risky behaviors while also encouraging positive, safety behaviors.

Social cognitive outreach is the most influential among adolescents due to their development (Sanders, 2013). Adolescents' concrete and egocentric thinking, and identity seeking psychosocial phase enlighten high drowning rates in the population, yet also present the use of peer and social influence in creating an effective intervention. The educational intervention utilized other students in the video for social peer influence while enabling their ability to think abstractly regarding an experience that they may have not experienced before.

Although all subconstructs were not measured directly, the proposed intervention was intended to impact participants' expectations, perceptions, and reinforcement via improvement of self-efficacy and self-beliefs via modeling, education, and social support (Borgersen, 2013). Ultimately utilizing adolescent specified cognitive and psychosocial development in the intervention in an SCT process, allowed prediction that the open-water adolescent intervention would increase individual water-safety knowledge. SCT as foundation for my intervention sought to determine the preliminary efficacy of an adolescent-targeted water safety intervention on student's knowledge of safe open water practices, to determine the acceptability and feasibility of the intervention among firefighters and teachers delivering the intervention and to describe the process and cost of creating and implementing an adolescent-based open-water safety intervention.

Conclusion

In summary, the significance and theoretical structure for the current study were described in Chapter 1. Behaviors can be predicted through adolescent development stages, social influence, and improving knowledge development. The reasoning behind the current study was that an educational program would: 1) address risky behaviors related to self-regulation, building of skills, attitudes, and self-beliefs with emphasis on social influence and knowledge attainment; 2) encouragement of autonomy and increasing knowledge framework regarding age appropriate water safety in adolescents will regulate behaviors and improve awareness; and, 3) establish an intervention with community acceptability, practicality, and potential for efficacy; has prospective success for continued delivery and intended outcomes –increased knowledge, perceived appropriateness and intent to continue use, and practicality. Chapter 2 includes a

synthesis of the literature of current water-safety interventions concepts selected from my theorized model.

CHAPTER 2: REVIEW OF THE LITERATURE

Chapter 2 consists of a synthesis of the literature on: adolescent and school age drowning interventions. Given the sparse literature specific for adolescents aged 14-19 years, the synthesis will also include interventions used in the school-aged population for comparable applicability in adolescent drowning prevention. Therefore, the aim of the literature review is to identify and analyze studies of interventions designed to reduce drowning in children and adolescents aged 6-19.

Introduction

Drowning remains a leading cause of preventable death in children and adolescents in the US. Denny et al. (2019) notes that the risk of drowning increases substantially at age 15 through adulthood; occurring primarily in natural water settings such as rivers and lakes. The American Academy of Pediatrics (AAP) reports that approximately 69% of adolescents aged 15 to 19 years of age, drown in fresh bodies of water (Weiss, 2010). More specifically, 24% of Arizona's fatal child drowning cases occur in open water such as rivers, lakes, and canals (Arizona Department of Health Services, 2014). Given the high drowning rate among adolescents in open bodies of water, it is important to establish whether an educational intervention is warranted and reasonable (Leavy et al., 2015).

One study has shown that 85% of drowning events can be avoided through primary preventative efforts such as supervision, swimming instruction, technology, regulation, and public education (Austin & Macintosh, 2013). The lack of prevention poses life-long personal impressions and misfortune on the public, posing a substantial public health issue; "Every drowning presents the failure of prevention" (Austin & Macintosh, 2013, p. 397). Yet the

Arizona Department of Health Services (2014) emphasizes a massive public health gap in understanding and preventing open-water drowning in older children. There is great deal of drowning research focused on children ages 0-4 in the bath tub or pool settings. Consequently, global rates of adolescent drowning in open bodies of water maintains high, and under researched, particularly in Arizona.

The current project examined the feasibility of an educational water safety intervention among adolescents aged 14-18 years. This area has been surprisingly neglected despite high drowning rates with the greater part of literature focused on children ages 0-4 and/or the residential water setting. Petrass and Blitvich (2014) put emphasis on this disparity:

> '*There is a lack of empirical evidence regarding the drowning risk and protective factors inherent in the later age groups and the diversity of drowning locations and activities within these groups makes prevention a significant challenge* (p. 188).'

To appreciate the effects of an education intervention, we must examine, in detail, the different existing interventions that have been used to prevent adolescent drowning.

Traditionally, researchers have aimed to gain an understanding of: adolescent drowning risk factors, drowning in the setting of the home (i.e., swimming pools & bath tubs), and drowning prevention of young children. However, such a narrow focus may not fully explain drowning prevention among older children and adolescents in open-water settings. The Arizona Department of Health Services (2014) emphasizes that a lack of documentation and clarity concerning drowning among older children and open-water locations, poses massive challenges in drowning prevention. Because educational water safety programs have been shown to avoid drowning in the younger childhood population for home water settings, understanding its effects on adolescent attitudes, behaviors, and knowledge facilitates drowning prevention in the older

childhood population (Weiss, 2010). Therefore, instead of excluding older children and open-water settings from child drowning prevention, they should be explored in their own right.

The literature was focused on intervention studies addressing the prevention of fatal and non-fatal school-aged and adolescent drowning. A modified PRISMA (2015) flow chart depicts search results (Figure 2). Literature published in the English language between 2005 and 2018 were examined using CINAHL, PubMed, and the Cochrane Library. Original search terms used were "adolescent," "child," "prevention and control," and "drowning." Papers were assessed according to the following inclusion criteria: 1) studies where an in-person intervention was implemented and evaluated; 2) a measure of behavior was included; 3) drowning incident was unintentional; and, 4) sample was of children and adolescents aged 6-19, or at least 50% of the data was related to children and adolescents aged 6-19 years.

Initial results identified 206 abstracts from which 179 were in English, 116 were excluded, as they were outdated past 10 years. Additionally, 63 articles were assessed against the inclusion and exclusion criteria. Finally, eight articles were retained for inclusion in the review. The process for retention of the studies is outlined in Figure 2.

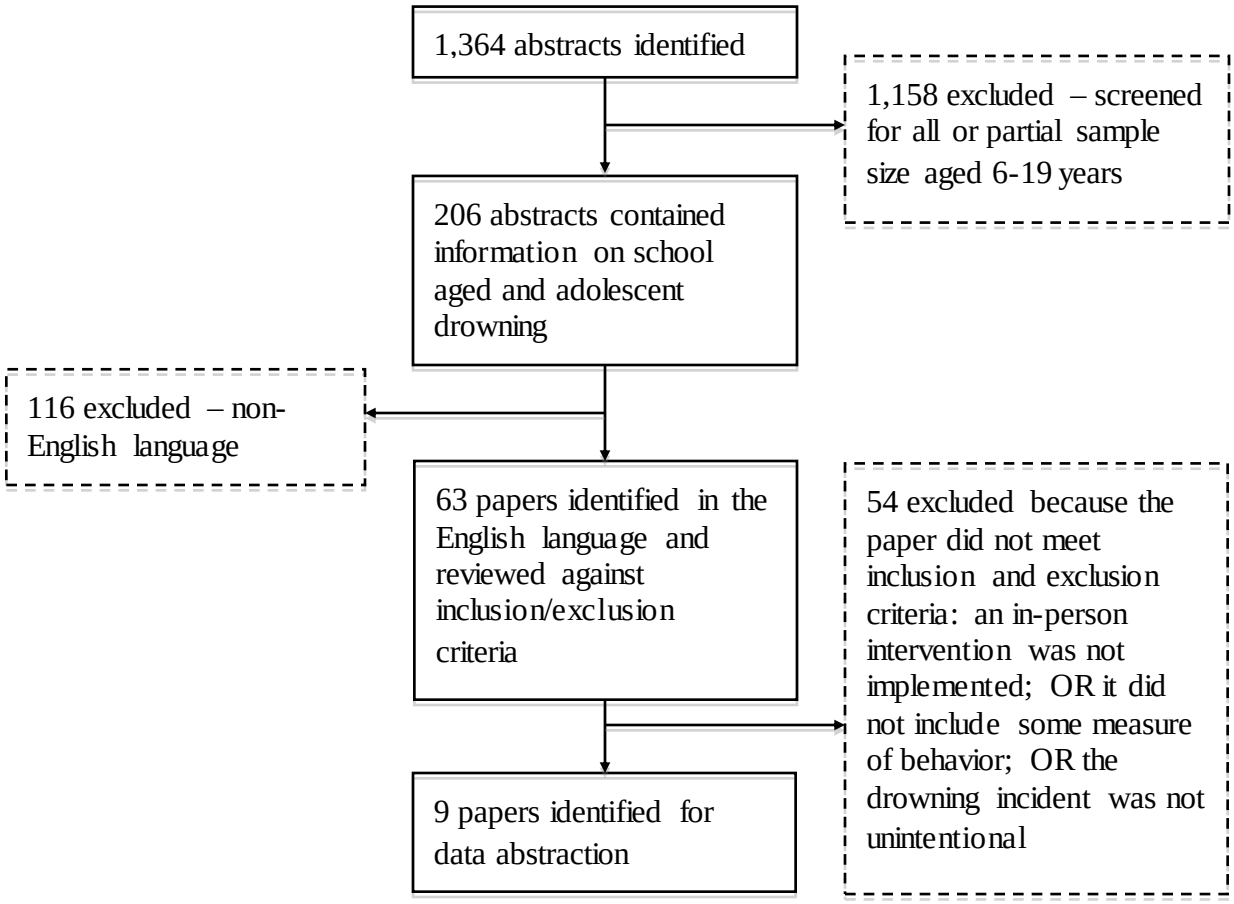

FIGURE 2. Literature review.

There was one randomized-control trial (Shen, Pang, & Schwebel, 2016). The majority (7) of the research papers were pre-/post-studies with two studies utilizing a control group for comparison, and five without (Beattie, Shaw, & Larson, 2008; Davoudi-Kiakalayeh, Mohammadi, Yousefzade-Chabok, & Jansson, 2012; Lawson, Duzinski, Wheeler, Yuma-Guerrero, Johnson, Todd Maxson, & Schlecter, 2012; Petrass & Blitvich, 2014; Rahman, Bose, Linnan, Rahman, Mashreky, Haaland, & Finkelstein, 2012; Soloman, Giganti, Weiner, & Akpinar-Elci, 2012; Terzidis, Koutroumpa, Skalkidis, Matzavakis, Malliori, Frangakis, DiScala, & Petridou, 2007). One of the studies was a case-control study (Brenner, Taneja, Haynie, Trumble, Qian, Klinger, & Klebanoff, 2009). Two of the studies were from the United States

(US) (Brenner, Taneja, Haynie, Trumble, Qian, Klinger, & Klebanoff, 2009; Lawson, Duzinski, Wheeler, Yuma-Guerrero, Johnson, Todd Maxson, & Schlecter, 2012), two were from Australia (Beattie, Shaw, & Larson, 2008; Petrass & Blitvich, 2014), one was from Iran (Davoudi-Kiakalayeh, Mohammadi, Yousefzade-Chabok, & Jansson, 2012), one was from Bangladesh (Rahman, Bose, Linnan, Rahman, Mashreky, Haaland, & Finkelstein, 2012), one was from Grenada (Soloman, Giganti, Weiner, & Akpinar-Elci, 2012), one was from China (Shen, Pang, & Schwebel, 2016), and one was from Greece (Terzidis, Koutroumpa, Skalkidis, Matzavakis, Malliori, Frangakis, DiScala, & Petridou, 2007). The most common age group targeted in the studies included in this review was 6-12 years. Only one study was specified for school-aged and adolescent children (Brenner, Taneja, Haynie, Trumble, Qian, Klinger, & Klebanoff, 2009). None of the studies were individualized for adolescents 14-19 or high school students only.

Water Safety Educational Interventions

Educational interventions are targeted to improve knowledge base to produce a change in attitudes, beliefs, and behaviors. The American Academy of Pediatrics (AAP) emphasizes that the use of educational interventions is imperative in the primary prevention of injury, particularly drowning of infants, children, and adolescents (Weiss, 2010). All of the studies included aspects of education primary prevention. Five out of the nine studies utilized water safety education as the only intervention source (Beattie, Shaw, & Larson, 2008; Lawson et al., 2012; Petrass & Blitvich, 2014; Soloman, Giganti, Weiner, & Akpinar-Elci, 2012; Terzidis, Koutroumpa, Skalkidis, Matzavakis, Malliori, Frangakis, DiScala, & Petridou, 2007). Three studies employed both educational interventions with swimming lessons and/or rescue skills (Brenner, Taneja, Haynie, Trumble, Qian, Klinger, & Klebanoff, 2009; Davoudi-Kiakalayeh, Mohammadi,

Yousefzade-Chabok, & Jansson, 2012; Rahman, Bose, Linnan, Rahman, Mashreky, Haaland, & Finkelstein, 2012). Finally, one study used a testimonial-based video intervention (Shen, Pang, & Schwebel, 2016).

Shen, Pang and Schwebel (2016) conducted a randomized control trial. Safety knowledge and perceived vulnerability were measured utilizing questionnaires and observed dollhouse simulated behavior play near water. Video-based testimonials of drowning risk or dog-bite risk were used as the intervention and control groups respectively. Although the intervention group did not show increased perceived vulnerability, the results showed improved safety knowledge and simulated water safety behaviors in comparison to the control group. This study emphasized limited efficacy with use of educational water safety programs among children.

Seven of the water safety intervention studies used a pre- and post-test design (Beattie, Shaw, & Larson, 2008; Davoudi-Kiakalayeh, Mohammadi, Yousefzade-Chabok, & Jansson, 2012; Lawson et al., 2012; Petrass & Blitvich, 2014; Rahman et al., 2012; Soloman, Giganti, Weiner, & Akpinar-Elci, 2012; Terzidis, Koutroumpa, Skalkidis, Matzavakis, Malliori, Frangakis, DiScala, & Petridou, 2007). Drowning mortality as the objective measure in one study exhibited significant decrease in death probability when compared to a control group (Wallis et al., 2015). Moreover, the findings described the use of improved lifeguard services and elimination of unnecessary reservoirs are potential covariates in decreasing mortality. Therefore, it is difficult to attribute decreased drowning mortality fully to public water safety education.

Three studies used knowledge to measure the impact of the intervention via comparison of water safety knowledge from baseline versus post intervention (Lawson et al., 2012; Soloman, Giganti, Weiner, & Akpinar-Elci, 2012; Terzidis, Koutroumpa, Skalkidis, Matzavakis, Malliori,

Frangakis, DiScala, & Petridou, 2007). The studies demonstrated statistically significant increase in water safety knowledge post intervention. However, older children and adolescents exhibited slight improvement or no significant improvement in knowledge scores in comparison to younger children exposed to the intervention (Denny et al., 2019). All three studies documented the highest retention of water safety knowledge and attitudes from a water safety educational intervention among kindergarten, first, and second grade students.

Additionally, Petrass and Blitvich (2014) and Terzidis, Koutroumpa, Skalkidis, Matzavakis, Malliori, Frangakis, DiScala, and Petridou (2007) found an association of water safety knowledge scores and attitudes and behaviors, which also seemed to be minimal in older children and adolescents. Finally, Beattie, Shaw, and Larson (2008) used both mortality and knowledge as measures pre- and post-test. These authors documented an increase in knowledge with an association of decreased mortality. However, data collection was a mixture of methods and varied measures, which seemed to threaten consistency and clarity of data.

Swimming Lessons

Swimming lessons are a method of intervention to reduce drowning under the assumption that swimming skill eliminates or greatly decreases the possibility of drowning. However, the American Academy of Pediatrics (AAP, 2010) policy statement states that swimming lessons at a very young age does not improve swimming skill proficiency, and can provide parents a false sense of security.

Two of the studies included swimming lessons as the in-person intervention. One case-control study examined mortality data and interviews to find associations of swimming lessons and drowning risk (Brenner, Taneja, Haynie, Trumble, Qian, Klinger, & Klebanoff, 2009).

Results revealed that formal swimming lessons provided an 88% reduction in drowning risk among children aged 1-4, but did not emphasize on older children and adolescence. Additionally, the study found income as a large confounding risk factor associated with drowning in children aged 5-19. There were limitations associated with generalizability of its findings, as data was collected from myriad populations with differing variables (laws, regulations, pools per capita, number of open-bodies of water, etc.) within multiple districts of Maryland, North Carolina, Florida, California, Texas, and New York.

Petrass and Blitvich (2014) used multiple methods within their intervention to teach swimming lessons, rescue skills, and water safety education. Results were consistent with the American Academy of Pediatrics policy statement (AAP, 2010), where previous formal swimming lessons and gender were not statistically significant in changing water safety knowledge, attitudes, and ability (Petrass & Blitvich, 2014). The study utilized various aquatic environments, which makes the findings generalizable to the open-body water setting. Additionally, the age group consisted of those 18-24 years, 82.2% were 18-19 years. Moreover, the 12-week program used multiple methods within the intervention, which may leave some ambiguity in regards to which aspect of the intervention was successful in bringing forth knowledge base, changed behavior, and reduced drowning rates.

Table 2 presents a summary of the literature studies reviewed. Overall, there was a lack in consistency of the measure and targeted age for the studies, which makes comparative analysis difficult. Few of the studies specifically addressed the older child and adolescent, and utilized a small sample of the age group to maintain a large age range. This provided between-group differences in age, but didn't hold much validity or reliability due to the group size comparison

discrepancies. The lack of data regarding older children and adolescents poses a huge gap in the reviewed literature regardless of the massive drowning disparity indicated by the CDC and AAP. Additionally, measures varied in knowledge base, swimming skill, parent-proxy report, observation, and mortality rates. Although the studies utilized these measures to determine a sense of feasibility and efficacy, it is inconsistent in whether the intervention brought forth a behavioral change among participants and overall decreased drowning rates. Only two of the studies utilized objective mortality rates, whereas the remaining employed subjected self-report or parent-proxy report, posing bias in results.

Lastly, the majority of the studies were not performed in the US. Only two of the eligible studies were carried out within the US (Brenner, Taneja, Haynie, Trumble, Qian, Klinger, & Klebanoff, 2009; Lawson, Duzinski, Wheeler, Yuma-Guerrero, Johnson, Todd Maxson, & Schlecter, 2012). One of the studies carried out in the US utilized various districts within six US states (Brenner, Taneja, Haynie, Trumble, Qian, Klinger, & Klebanoff, 2009), further threatening the generalizability of findings. Data can be altered through varying regulations and laws such as pool fences, boating laws, life vest use, etc. Additionally, geographical and climate variances pose altered data from water accessibility and exposure for drowning risk. Climate variation may affect the number of pools per capita and/or water recreational activities – a cold environment would likely not have pools in the average home or the ability to use open-bodied water recreationally.

Geographical differences may pose a decreased or increased availability of open-bodies of water – some areas may have more or less recreational water areas due to natural water development or city reservoir use. Importantly, the studies gauging effectiveness and

applicability vary too greatly in risk factors due to the huge variance in locations between the studies or multiple districts within an individual study.

TABLE 2. *In-person drowning interventions in children 6-19 years (included studies).*

Study Characteristics	Intervention Description	Measures	Results
Beattie, Shaw, and Larson, 2008 Aged 5-14 years 873 participants	The purpose of this study was to evaluate feasibility and sustainability of a community-based water safety program in children within remote areas of Australia. during 2006-2007 including an introduction of water safety into school curriculum.	Pre and post data comparison. Data consistent of a mixture of parental 10-point questionnaire, instructor subjective comparison of skill acquisition, and mortality rate pre and post intervention.	An increase of life saving and water safety skill acquisition from a mean of 2.8 and 2.3 points. More objective and consistent methods for evaluation need to be implemented.
Brenner, Taneja, Haynie, Trumble, Qian, Klinger, & Klebanoff, 2009 Aged 1-19 years 88 participants, control or nonparticipants: n=176	To identify and approximate the association of swimming lessons and the risk of drowning among those ages 1-19 years.	Case-control study utilizing data from the medical examiner and coroner's offices from 2003-2005 within identified districts of Maryland, North Carolina, Florida, California, Texas, and New York. Interviews with families were conducted to identify risk factors and variables.	Formal swimming lessons showed significant reduction (88%) in drowning risk among children aged 1-4. Income was identified as a major confounding factor among children aged 5-19.
Leavy, J.E., Crawford, G., Portsmouth, L. et al. J Community Health (2015) 40: 725. https://doi.org/10.1007/s10900-015-9991-6 Aged 6-21 years	To systematically identify and analyze the evidence for drowning interventions with an adult focus.	A systematic search was undertaken for peer-reviewed articles, which were published in English between 1990 and 2012, focused on adults and described a drowning intervention. After quality appraisal by expert reviewers using a purposively tailored checklist, a final total of six studies were included for review.	This review reinforces the need for a genuine and sustained global approach to addressing adult drowning prevention

TABLE 2 – *Continued*

Study Characteristics	Intervention Description	Measures	Results
Lawson, Duzinski, Wheeler, Yuma-Guerrero, Johnson, Todd Maxson, & Schlecter, 2012 Pre-K to Third Grade, mean age 6.9 years 166 participants	Safe Kids Coalition water safety curriculum and video in a low-income, minority-focused, urban youth summer camp over the course of 3 weeks	Pre and post test retention exam to assess knowledge – self-report, parent proxy assistance	Each group (pre-K, first and second grade, and third grade) revealed higher knowledge posttest scores; $p = .0097$, $p < .0001$, and $p < .0001$). Overall students demonstrated increased water safety knowledge with the intervention.
Petrass and Blitvich, 2014 Aged 18-24 18-19 (82.2%) 20-24 (17.8%) 135 participants	12-week program imbedded in students' undergraduate program consisting of swimming, survival and rescue skills, and watersafety education for various aquatic environments.	Knowledge, attitudes, and swimming ability Self-report questionnaire pre-post test	Swimming, water safety, and knowledge were low at baseline, improved post intervention ($p <$ 0.001). No significant change in skills and attitudes ($p = 0.079$). Previous formal swimming lessons and gender were not statistically significant in changing knowledge, attitudes, and ability.
Rahman, Bose, Linnan, Rahman, Mashreky, Haaland, Finkelstein, 2012 Aged 4-12 678 participants	A community education program in rural Bangladesh delivered over 3 weeks providing basic swimming water safety and rescue skills for children age 4-12 years.	Drowning related deaths of those in the program versus those who are not in 3 month cycles, cost, and cost-effectiveness	The SwimSafe program had a 100% graduation rate. Cost of the program was $13.46 per child, and is projected to prevent 49,874 drowning deaths with an averted $3,009 per death cost ratio.
Shen, Pang, and Schwebel, 2016 Aged 3rd and 4th grade 280 participants	RCT providing testimonial-based water safety/drowning risk education versus dog-bite risk education (control). Testimonial education was provided in video.	Safety knowledge and perceived vulnerability measured by self-report questionnaires and dollhouse play simulated behaviors near water	ANCOVA examined group differences and found post intervention safety knowledge and behavior score to be statistically improved in comparison to the control group Perceived vulnerability was not improved in the intervention group.
Solomon, Giganti, Weiner, and Akpinar-Elci, 2012 Aged 5-12 102 participants (92 students, 10 teachers)	American Red Cross Longfellow's WHALE Tales – primary prevention of drowning with water safety awareness and education among primary school children in Grenada	Knowledge regarding water safety pre and post test (9 question assessment) for students Adaptability and effectiveness five-point Likert, 11 question survey for teachers	Mean point knowledge increase for WHALE participants was 0.89 ($p <$ 0.001) with significant increase detected between second, third, fourth, and sixth graders pre and post test.

TABLE 2 – *Continued*

Study Characteristics	Intervention Description	Measures	Results
Terzidis, Koutroumpa, Skalkidis, Matzavakis, Malliori, Frangakis, DiScala, & Petridou, 2007 Aged 5-15 1400 participants	In-school water safety education in Athens, Greece. The participants were broken down into 3 age groups to explore age-specific changes in water safety knowledge and attitudes post intervention.	Pre and post age-specific questionnaires measuring overall knowledge and attitudes	The kindergarten and grade one intervention group showed significantly higher knowledge and attitudes. The elementary school group had slight improvement in knowledge score, and non-significant increase in attitude scores. The older children and adolescents showed no improvement in knowledge scores and minimal increase in attitude.
Wallis, B. A., Watt, K., Franklin, R. C., Nixon, J. W., & Kimble, R. M. (2015). Aged 0-19 years) 1299 participants	To redress the lack of Queensland population incidence mortality and morbidity data associated with drowning in those aged 0-19yrs, and to understand survival and patient care.	Patient data were accessed from pre-hospital, emergency department, hospital admission and death data, and linked manually to collate data across the continuum of care.	Incidence rates for fatal and non-fatal drowning increased over time, primarily due to an increase in non-fatal drowning. There were non-significant reductions in fatal and admission rates. Rates for non-fatal drowning that did not result in hospitalization more than doubled over the seven years.

Understanding the Impact of Water Safety Interventions Among Children

Water safety education is a primary prevention intervention imperative to reduce drowning mortality in the pediatric population (Weiss, 2010). Studies have examined the use of various educational interventions including overall water safety, swimming lessons, and rescuing skills. The American Academy of Pediatrics views environmental and individual interventions of the most efficacious among the pediatric population. Studies within the past 10 years have mostly utilized community-based or school-based water safety educational interventions with great success in children between 5-7 years. Studies utilizing swimming lessons as an intervention revealed significant reduction in drowning risk factors of children 1-4 years.

Although a few of the studies had adolescents in the sample, the size was small and did not provide enough data to fully evaluate the efficacy or feasibility among older children and adolescents. In fact, there was only one study specifically geared towards adolescent drowning prevention, in which the author emphasizes the lack of empirical evidence to support water safety education in adolescents, but values it's potential in drowning prevention due to its success in younger children; "young adults need to be equipped with sufficient swimming and water safety knowledge … where a drowning risk is present." (Petrass & Blitvich, 2014, p. 189).

Summary

Drowning continues to be a significant public health concern globally in older children and adolescents. While there have been a number of studies published investigating drowning interventions and prevention, there is a massive shortage of empirical evidence that provides insight to prevent adolescent and open-bodied water drowning. A large number of drowning intervention studies among the pediatric population performed in the past 10 years utilized educational water safety with higher levels of efficacy among young children in comparison to older children and adolescents. However, open-body water drowning statistics among adolescents is overwhelmingly high globally.

Water safety education interventions need to be considered in the context of feasibility and efficacy among this population. This project will develop and test the feasibility of a water safety intervention among adolescents, utilizing drowning risk factors identified in the literature and knowledge of adolescent development.

CHAPTER 3: METHODOLOGY

This chapter describes the methodology used in the study. The research design, sample, human subjects' protection, intervention, measures and instrumentation, data collection and analysis are described. The purpose of this study was develop and pilot test the feasibility of an adolescent drowning prevention intervention. This study examined the feasibility, preliminary efficacy, acceptability, and cost of an adolescent water safety and drowning prevention intervention. Limited efficacy was measured through student water safety knowledge attainment, acceptability was measured through stakeholder (firefighter personnel & high school teachers) perceived ease of use and perceived usefulness of the intervention, and practicality was measured through cost description of the intervention.

The study was guided by the following aims:

- Aim 1: Determine the preliminary efficacy of an adolescent-targeted water safety intervention on student's knowledge of safe open water practices.
- Aim 2: Determine the acceptability and feasibility of the intervention among firefighters and teachers delivering the intervention.
- Aim 3: Describe the process and cost of creating and implementing an adolescent-based open-water safety intervention.

Research Design

This study examined the preliminary efficacy, feasibility, acceptability, and cost of an adolescent water safety and drowning prevention intervention using a pre-experimental one-group pre-test/post-test design. Change in outcome measures (knowledge & perceived appropriateness) between data collection points was the main variables of interest, which was

defined as the feasibility community-based design in (Figure 3). Cost of the intervention was also determined.

Bowen et al. (2009) broadly defines feasibility studies as "… any sort of study that can help investigators prepare for full-scale research leading to intervention." (Bowen et al., 2009, p. 453). These studies provide findings to support potential efficacy of an intervention and whether an intervention should be endorsed for efficacy testing (Bowen et al. 2009). Feasibility studies are particularly useful with community partnership establishment and pre-experimental design by providing an understanding of whether the intervention has the potential to work, whether the intervention is trending to be valuable and practical, and if the intervention has the ability to be successful in the future (Bowen et al., 2009).

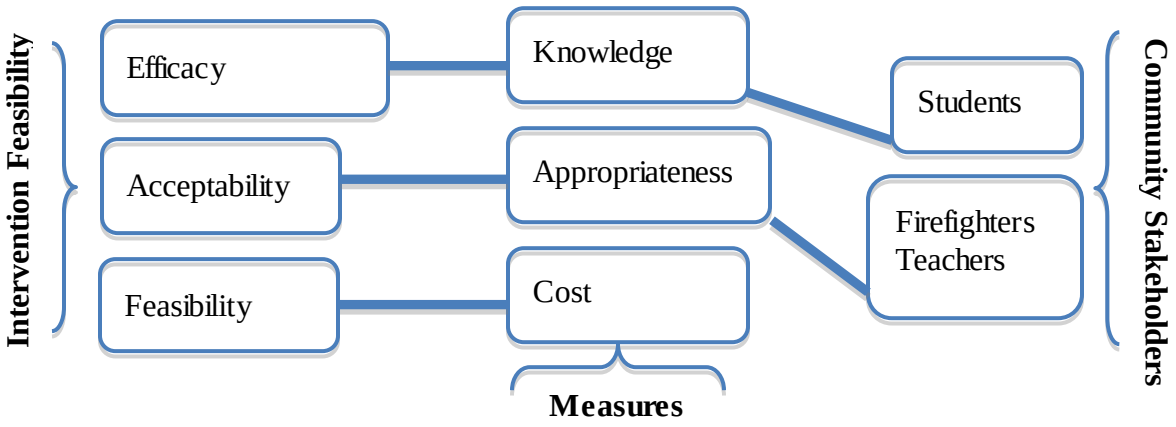

FIGURE 3. Feasibility community-based design.

Sample and Recruitment

The sample for the study included 26 high school students, 27 firefighters, and one teacher. Purposive sampling was used to recruit participants (Leedy & Ormrod, 2010). In purposive sampling, participants are chosen according to the objective of the research while adhering to the inclusion and exclusion criteria set forth for the study. The use of purposive

sampling will provide "purposeful selection" of participants which is viewed as effective because it allows the researcher to intentionally select participants who are able to present more robust and relevant answers or insights related to the objective of the study (Maxwell, 2012).

The eligibility criteria for the participants of the study was as follows:

- High school student's inclusion criteria:
  1) must understand, speak, and read English;
  2) must be between 14 – 19 years old.
- Firefighter's and teacher's inclusion criteria:
  a) Must be a current firefighter in the fire department or teacher in the high school where the dissertation was conducted;
  b) Have undergone orientation of the water safety intervention proposed in this study;
  c) Must be 21 years old or older.

This project was approved by the University of Arizona IRB (Appendix A), the selected school, (Appendix B) and the fire department in Arizona (Appendix C). Specifically, the high school student participants were recruited through the students' physical education (PE) course. The high school teacher and their potential corresponding aides initiated recruitment after approach from fire department personnel.

A previous systematic review of information and communication interventions for changing behavior in children found average effect sizes ranging from 0.03 to 0.41 (Lau, Lau, Wong, & Randsell, 2011). The review provided a wide range of effect sizes with the average in the small to medium effect size, requiring a larger sample to produce statistically significant results in comparison to the literature. Therefore, a medium anticipated effect size would be used

for calculation of sample size. Using G*power with following parameters: f^2=0.3, desired statistical power = 0.8, predictors = 3, probability = 0.05; *t*-test (matched pairs), the required sample size is a minimum of 27 to detect the intervention's effect. That is, there should be at least 27 total participants. Some 28 firefighters participated in the study, completed consent forms and the questionnaire. And 26 high school students participated in the study. A sum total of 54 participants were included.

Setting

The intervention implementation and data collection was completed at Boulder Creek High School in Phoenix, AZ during physical education cheerleading practice. The intervention video and fire department education was provided in a gymnasium classroom. Students and the teacher completed both the pre- and post-intervention surveys in the same classrooms. Fire department personnel completed their surveys at Daisy Mountain Fire Department stations 141, 142, 145, and 146.

Human Subject Protection

Participants between the ages of 14-18 years provided written informed assent and parental consent. Parental informed consent was obtained (Appendix H) to ensure that parents or guardians were aware of the conditions of the study as well as the role of their children in the study. All students in the class were included in the water safety education class, but were not included in data collection if they did not provide participant assent (Appendix F & I) and parental consent requirements. Water safety education is a relevant and reasonable educational topic to be included in high school physical education curriculum without parental permission, and therefore all students were allowed to attend without data participation.

An informational letter (Appendix D), flyer (Appendix G), informed consent form (Appendix F & H), and assent form (Appendix I) were sent home to the potential adolescent participants and their parent(s)/guardian(s). The letter assured the parent(s)/guardian(s) that their childrens' participation was completey voluntary, confidentiality of all data was assured (the participants and their families were not identified), that they were able to withdraw at anytime, and that class grade was not affected/there were no adverse outcome for those who decided not to participate. The study principal investigator's contact information was provided in the listed documents. The information process provided parent/guardian involvement, and enables autonomous participant will to contribute in participation as well. This process also allowed for voluntary withdraw at any time without adverse effects.

Adolescent participants 19 years of age were able to sign their own consent form (Appendix F) without the need for parental consent. Signed informed consent and assent forms were obtained from the parents or guardians (Appendix H) and adolescent (Appendix F & I) participants before participating in the survey. All subjects were assured that participation was voluntary, and that they may have withdrawn at any time without any adverse outcome for them. Informational flyers (Appendix G) to the participating subjects and their parents/guardians will also emphasize confidentiality and protection of personal information. Any participants that withdrawal from the study will have all data destroyed, and will be excluded from analysis.

Firefighter and teacher participants were also given informational flyers and consent forms (Appendix E) for participation. The firefighters were assured by the principal investigator and crew captains that their job performance, advancement, and pay would not be affected if they chose to not participate. Like the student participants, the firefighters were assured that they

may voluntary withdraw from the study at any time without adverse effects. Consent was obtained by each firefighter that was involved with creating the intervention video, intervention implementation, and data collection.

The one participating teacher was given both informational flyers and a consent form. Procedure with voluntary participation without negative affect on job or advancement was also utilized. Consent was obtained from the teacher participant.

All subjects were assigned a code number. Information from the surveys were secured in a locked box in the researcher's home office until the completion of the study, in which only the researcher, IRB, dissertation committee, and the data collecting fire department personnel had access. After completion of the project, forms and study documents will be stored at the University of Arizona College of Nursing Room 419 for six years, and then will be destroyed. Subject privacy and confidentiality was ensured by the following: 1) minimum subject identifiers was collected; 2) all data access including identifiers had limited access (as described above); 3) secure modes of data transmission was carried out with electronic key encryption; and, 4) the researcher was and will continue to honor obligation to report any potential breach of confidentiality to the IRB within 10 days of the adverse event. There were no adverse events risking participant confidentiality during the study.

The PE teacher and PI notified the adolescent participants of the results. Additionally, a presentation given by the PI will provide study results to the fire department and high school staff members after completion of the study.

Intervention

The intervention consisted of a 20-minute video (Appendix J) developed by the investigator, Daisy Mountain Fire Department, and adolescent stakeholders. The script was written with the involvement of a professional scriptwriter, the principal investigator, and the fire department (Appendix K). The script was written to include the following water safety education topics: swimming skills, supervision emphasis, CPR basics, risk behaviors and consequences (alcohol, drugs, cliff jumping, distance swimming), and boating safety (Table 3). After development and IRB approval of the script, a professional videographer was employed to record script narration, a mock adolescent drowning at local Phoenix lake, Lake Pleasant, and Daisy Mountain Fire Department footage.

The video was provided as an in-person lecture administered in the high school setting via local fire department and high school teacher personnel. The video was created following the educational topics and content described in Table 3 with delivery and appearances from the fire department and students in the school media production class. Educational content was based on information from the American Academy of Pediatrics (2003) and the Inland Empire Swimming (IES) Safety Committee (n.d.). The intervention was conducted during PE course, lasting 45 minutes including pre-surveys, 20-minute video (Figure 4; Appendix J), and post-surveys.

FIGURE 4. Footage from water safety intervention video filming.

TABLE 3. *Education segments for adolescent recreational water safety video.*

Topic	Main Content
Introduction	Overview of topic including statistical impact on target population, educational topic outline
Primary Prevention: Swimming	Swimming ability, floating and treading water, underlying health conditions, diving, swimming in open water versus pool (depth, water temperature, weather, hazards in murky water, inaccessibility of emergency services), life jacket use
Primary Prevention: Supervision	Letting your parents/guardian know where you will be swimming and creating a system for check in, utilizing friend buddy system, adult present if teen is operating a personal watercraft
Primary Prevention: Risk Behaviors	Alcohol and drug use, cliff diving, peer influence
Primary Prevention: Boating Safety	Consider boat safety course especially if you will be operating a personal watercraft, have vessel checked often for mechanical and structural issues, life jacket use, alcohol and drug use, carbon monoxide monitor, boating laws, flag use
Secondary Prevention: CPR Basics	Do not delay getting help, CPR basics – getting the person to safety safely for the rescuer, chest compressions, 7 steps to safety from fire department
Conclusion	Summary, resources: swimming instruction, further information, boating safety course, fire department

Adolescent Development and Intervention Development

Social cognitive theory (SCT) studies suggest that health knowledge and behaviors are predictably influenced when an intervention is created with the application of unique underlying behavioral mediators such as cognitive and psychosocial development of the target population (Dewar, Lubans, Plotnikoff, & Morgan, 2012). It is imperative to utilize social-cognitive

development to effectively impact health and safety related knowledge and behaviors in adolescents (Bandura, 2004).

Cognitive Development

Adolescent cognitive development includes concrete and abstract assessment surrounding their ego (Sander, 2013). They have a sense of introspection and decision making abilities that are developmentally unique in their learning and expressed behaviors (American Psychological Association [APA], 2016). Although peer influence has a great cerebral impact on adolescents' decision making, adults also play a large role in modeling good decision making and posing hypothetical situational processes of cognitive thinking in adolescents (APA, 2016). Effective methods of influencing adolescent cognitive decisions are through peer modeling and social influence, and adult-delivered education (APA, 2016).

The intervention was developed utilizing both peer and adult influence to target adolescent cognitive development. The script was developed by an adult script writer, and adolescent peers were interactive with video filming, including an adolescent actress. The adolescent peer in the video modeled water safety concerns throughout theoretical recreational water scenes, while also posing the corresponding possible consequences with unsafe water practices. Additionally, adult influence with firefighters and teachers was provided in the video and during the in-class lecture. Effective cognitive outreach in the adolescent population requires both peer and adult influence, harnessing their cerebral ability to think abstractly and hypothetically to capably enable their competence in subjective decision-making (APA, 2016).

Psychosocial Development

The adolescent's psychosocial development revolves around self-identity, in which the adolescent strives to identify with peers (Sanders, 2013). Although peer orientation is strongest in adolescents, they strive to also please their parents and other adults as they begin to develop their own moral judgments and values (APA, 2016). In fact, studies have shown adolescents' desire adult guidance in emotionally charged safety situations (APA, 2016). Adults have the ability to influence adolescent social skills and establish what is socially acceptable or morally correct (sexual education, rape, etc.), family relationships (parent-teen conflict), school and work (social balance and responsibility), community (SES, community involvement), faith institutions (pro-social positive value influence), and the media (adult and peer social reinforcement) (APA, 2016). Negative social interactions on any of the aforementioned platforms can cause an unconstructive personal view on success, identity, and self-esteem. Positive social reinforcement allows the adolescent to create constructive morals, values, and beliefs.

Media is a large platform for adolescent psychosocial influence for today's generation. In fact, media is related to the next generation's "community," consisting of approximately six to eight hours of music, television, videos, and internet exposure per day for the average American adolescent (APA, 2016). Media outlets are ideal safety educational outreach in the adolescent population. Utilizing a media-technology intervention with both peer and adult influence is socially, cognitively, and technologically appeasing to the adolescent population. Utilizing both peer and adult social influence in the intervention video is ideal in targeting psychosocial development in adolescent when addressing water safety, which is why a video was used for education in the sample group.

Adolescents and Intervention Technology

The rise of the net generation has brought forth a new era of learning; changing the methods and strategies among educators and learners alike (Mastrian, McGonigle, Mahan, & Bixler, 2011). This poses the emphasis on educational technology in adolescents in two ways: 1) pedagogical implications have changed (more success is seen with technology-based visual and reproduction strategies); and, 2) technologies and informatics in today's youth is much more widespread and advanced. Technology-based educational outreach has been proven to be beneficial in providing educational resources to large groups of students in a variety of disciplines (Mastrian, McGonigle, Mahan, & Bixler, 2011).

Adolescent social-cognitive development coupled with their propensity to learn best with technology-based interventions makes the application of a peer structured water safety video ideal. The video tended to adolescents' net generation technology accepted educational outreach while also utilizing peer-influence with adult direction to accommodate abstract hypothetical water safety cognition, and form their own educational outlook on water safety knowledge foundation.

Intervention Fidelity

Monitoring fidelity is established (Shadish, Cook, & Campbell, 2002) with thorough and proper training of those delivering the intervention. Strengthening the intervention fidelity, helps to ensure internal validity. Internal validity is the certainty of causal inference, confirming that outcomes are brought forth by the intervention as opposed to other possible origins (Trochim, 2006). Ensuring internal validity is maintaining a true causal relationship of the intervention to the outcome (Borgersen, 2011).

Intervention protocol is an optimal way to ensure that co-variates and variance is decreased as much as possible. This is best accomplished throughout the intervention by ensuring that the intervention is delivered consistently and reliably: 1) systematic variance – ensure there is only one variable difference between the groups (i.e., environment, delivery of intervention, etc.); 2) error variance – reduce differences through adequate sample size, similar demographics; and, 3) extraneous variance – narrow the target population to be specific and homogenous (Kazdin, 2003; Shadish, Cook, & Campbell, 2002). Therefore, fidelity elements that assessed in the study included: 1) intervention-delivering fire department and teacher personnel intervention orientation; 2) standardized delivery of the intervention via water safety video; 3) same room and environment will be used between the classes; and, 4) scheduled classes with the same dose of the intervention. Monitoring the implementation and delivery of the intervention significantly strengthened fidelity and internal validity.

Intervention Content Validity

Content validity is the degree to which the research accurately translates the constructs of interest into the operationalization (Trochim, 2006). Content validity ensures that the operationalized constructs are being addressed in the proposed intervention. Therefore, an expert panel of three firefighters from the fire department water safety program assessed content validity components. Utilizing the intervention video content listed in Table 3, the expert panel watched the video after completion to ensure content was accurate and present throughout the video.

Instrumentation and Measures

The means of data collection for the study included survey questionnaires and cost reports. The questionnaires were self-reported and multiple-choice true or false answers. In addition to collecting self-reported water safety and drowning prevention knowledge, the questionnaires also collected socio-demographic variables including age, gender, length of residence in Arizona, and ethnicity for descriptive statistics.

Water Safety and Drowning Prevention Knowledge

The Aquatic Recreation Knowledge-Attitudes-Behavior (KAB) self-report questionnaire (Figure 5) was a study validated among New Zealand youth aged 15-19 years (Moran, 2006). Development of the KAB underwent four pilot studies to ensure reliability of the questions among 11th year adolescents' water safety knowledge, attitudes, and behaviors. Additionally, an expert panel of drowning prevention specialists from national and regional organizations reviewed the questionnaire and provided feedback for modifications to ensure content validity.

The KAB consisted of 25 items. However, for this study only 19 items were used since the other items were not appropriate for this study. Questions 1 to 6 are for the demographic questions. Recreational water frequency, type of recreational water use, and who accompanied youth were assessed in questions 9, 10, 12, and 13. Three questions assessed water safety knowledge including: swimming ability (question 17); rescue ability (question 18); and CPR ability (question 19). Towards this end, there were three subscales that ultimately guided this research and were consistent with the framework: water safety knowledge, attitudes risk perception, and risk behaviors. Two questions assessed water safety through risk perception (question 20) and attitudes (question 23). Finally, four questions assessed behaviors via

swimming at risk behaviors (questions 11 & 14) and Moran (2006) Swimming Behaviors (items 15 & 16). Moran (2006) describes the assessed at risk behaviors as: swimming outside of patrol flags, lifejacket use, and alcohol and drug use during recreational water activities. Composite scores were created for each of the constructs of knowledge, behaviors, and attitudes by combining the responses of the question items under each construct as one single composite score.

Test-retest reliability of the KAB was conducted between Moran's pilot studies three and four. Inter-correlations between the questions were broken down to compare similarities of responses using Spearman's rank. Recollection of recreational water activity location and frequency had a correlation coefficient ranging .758-.959. Overall total risk perception had a correlation coefficient of .791. Lastly, water safety attitudes had an alpha coefficient of .860. Consistency in test/retest exhibits reliability of the question in the KSB.

The theoretical framework for development follows the KAB model (Figure 5). This model relates the use of previous experiences, familial and peer influence, and education to an individual's unique perception of water safety KAB (Moran, 2006). Additionally, Moran (2006) discusses the ability to influence these factors to improve water safety KAB. This is remarkably similar to the use of Bandura's SCT, employed as the framework for this study's intervention, conceptualization of influencing knowledge, attitudes, and behavior through the constructs of reciprocal determinism and social influence. Therefore, the use of the KAB to measure water safety knowledge holds similar theoretical attributes in addressing water safety knowledge.

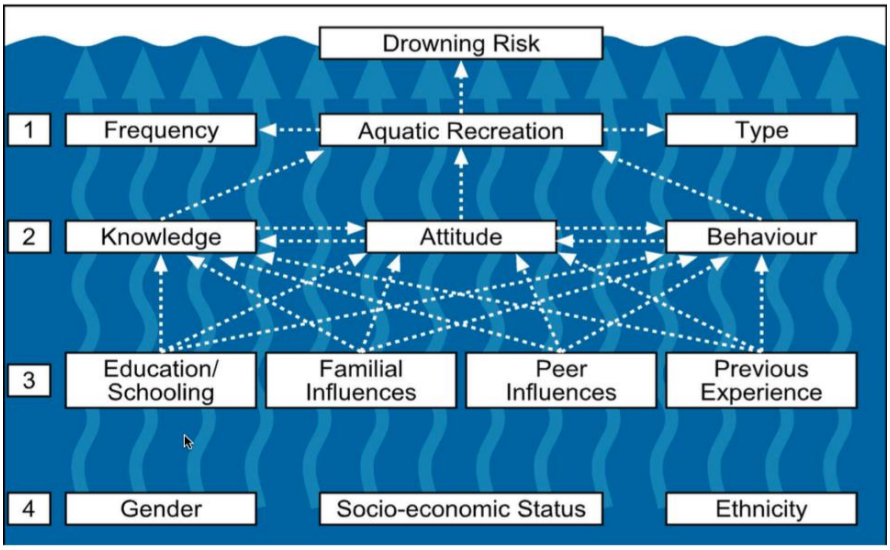

FIGURE 5. Drowning risk among youth related to KAB theoretical model (Moran, 2006).

Acceptability

The Technology Acceptance Questionnaire (TAQ) (Davis, 1989) was utilized among firefighters and teachers administering the intervention to assess perceived acceptability in the community (Figure 6). Modifications to the TAQ for the current study included its use in a technology-in-person hybrid educational environment, and an additional question to assess intent to use: "If the *Water Safety Intervention for Adolescents* was available for regular use in public safety education, would you use it?" The 29-item survey consisted of 28, six-point Likert scale questions (ranging from *strongly disagree* to *strongly agree*), and one, 'yes'/'no' question. The first 14 questions assessed perceived usefulness of the intervention. The second set of 14 questions examined perceived ease of use. Finally, the last question addresses intent to use in the future.

Saade and Bahli (2005) assessed perceived usefulness and ease of use of an on-line learning environment with the survey. Internal consistency utilizing Rho coefficients of the

follow constructs were above 0.5, exhibiting survey reliability: cognitive absorption (0.76), perceived usefulness (0.92), perceived ease of use (0.91), and intention to use (0.87).

The acceptance questionnaire, TAQ, utilized the Technology Acceptance Model (Figure 6). This model depicts how the user may come to accept and utilize technology. Interrelated concepts such as an individual's subjective attitude may influence other main constructs directly related to acceptability such as perceived ease of use and perceived usefulness. The previously described constructs ultimately directly influence the user's acknowledgement and intent to continue use. Davis (1989) define perceived usefulness as an individual's belief that a specified implemented method would improve performance, whereas perceived ease of use is the subjective belief that said system would be free from effort.

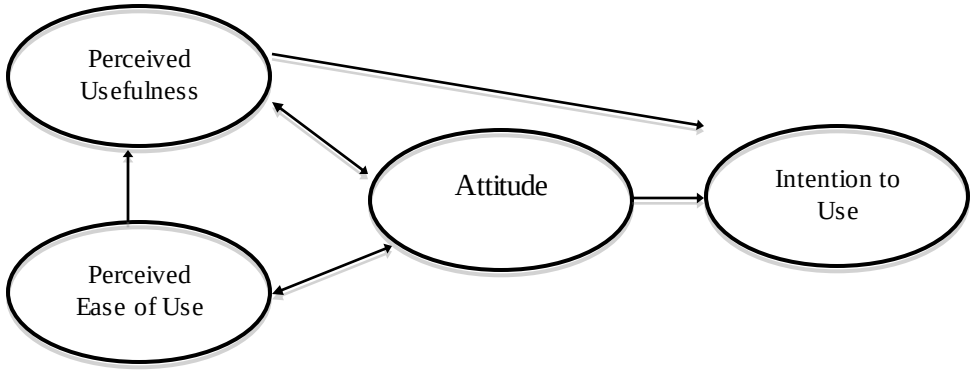

FIGURE 6. Technology acceptance model.

Cost Description

Costs to create and implement the intervention were obtained. The cost of the video includes production costs, materials used in the video, and materials to make the video (equipment, CD's, etc.). Initial cost of creating video is anticipated to be high secondary to script development, videography, and editing; but offset secondary to volunteer involvement. Material

costs are anticipated to be low due to the high school's and fire department's assistance in loaning production, camera, and CPR materials. Projected costs for the intervention that were not donated include: CD's and Target gift cards. A list was kept with expenditures experiences throughout the intervention development and implementation. They were distinguished between donated/volunteered services/no cost verses an itemized amount. The amount was added up at the end of one cycle of the intervention, which includes a series of four PE classes where the intervention was implemented. Costs regarding the making of the intervention and implementing the intervention were provided for community financial ability to continue use.

Feasibility

Overall feasibility was assessed through the constructs of knowledge (KAB), (Moran, 2006), acceptability and perceived used (TAQ) (Davis, 1989), and cost description, which are correlated with Bowen's feasibility study outcomes of interest (Table 4). Bowen et al. (2009) lists the main areas of focus in feasibility studies to be the following: acceptability, demand, implementation, practicality, adaptation, integration, expansion, and limited efficacy. The measured construct of adolescent water safety knowledge attainment addresses the feasibility area of limited efficacy; showing how the measure has promise of water safety knowledge attainment success within the adolescent population. Acceptability is a defined feasibility area of focus which concentrates on the firefighters' and teachers' perceived intent to continue use, demand, and expansion. Finally, cost description of the intervention will focus on feasibility study's areas of practicality and integration.

TABLE 4. *Intervention fidelity.*

Outcome Measure	Study Focus	Data Collected
Knowledge	• Limited efficacy	• Intended effect of intervention on water safety knowledge
	• Implementation	• Success of intervention to evaluate execution
Acceptability	• Acceptability	• Intent to continue use
	• Demand	• Ease of use – perceived fit within community and organization
	• Expansion	
Cost Description	• Practicality	• Ability to continue intervention
	• Integration	• Sustainability
		• Cost to organization

Data Collection Procedure

A list of students selected for the intervention was given to the researcher, in which the researcher sent a letter (Appendix D) home with the students addressed to the student and their parent(s)/guardian(s). The letter provided materials to the student and their parent(s)/guardian(s) to introduce the purpose of the study via Research Information Sheet, ensure voluntary participation and confidentiality, provide researcher contact information, and to request permission for involvement. Parents were requested to sign the informed consent form (Appendix H) included in the letter to signify their consent in letter their child to participate in the study. In addition, students were required to provide their consent or assent by signing a form (Appendix F & Appendix I). The signed forms were given back to the researcher before any data collection. Only students who provided assent and whose parent's provided consent were included as participants in the study. Students who were not participating in the water safety intervention went to regular PE class, and the water safety intervention participants were in a separate classroom.

Once the adolescent and parent accept participation in the study and parental and adolescent assent was provided, the educators of the intervention program, the firefighters, administered the pre-intervention questionnaire. The educational intervention portion was then

provided, followed by the post-intervention questionnaire. Fire department and high school teachers were recruited by the researcher to deliver the intervention through convenience sampling and volunteer consent. A survey was provided post-intervention to administering firefighters and teachers to evaluate perceived community stakeholder acceptability of the intervention. Finally, a post-intervention cost examination was conducted.

The pre- and post-questionnaires had subject ID numbers to ensure confidentiality, and no names were used on the surveys. A $10 Target gift card was given to the participating student following the post-intervention survey.

Data Analysis

Data analysis consisted of three analyses: comparison analysis of pre-/post-intervention water safety knowledge among the adolescent students, post-analysis of the perceived appropriateness and acceptability from the firefighters and teachers, and a cost description.

Aim 1 was addressed by conducting independent sample *t*-test and chi-square test of difference. An independent sample *t*-test was conducted to determine differences in the continuous measured scores of knowledge, attitudes, and behaviors about water safety of the students between pre-intervention and post-intervention. An independent sample *t*-test analysis is used to compare if there is a significant difference between two groups based on a given variable that is continuous measured. The independent variable was period (pre-/post-intervention) and the dependent variables were composite scores of the knowledge, attitudes, and behaviors about water safety. In order to perform the *t*-test analysis, the mean scores of the two groups were calculated for each of the composite scores of the knowledge, attitudes, and behaviors to compare difference of scores. A chi-square test of difference was conducted to determine

difference in the categorical measured recreational water frequency, type of recreational water use, and who accompanied youth between pre-intervention and post-intervention. A chi-square test of difference is used to determine differences between groups that are categorically measured. The independent variable was period (pre-/post-intervention) and the dependent variables were the response on recreational water frequency, type of recreational water use, and who accompanied youth. Frequency and percentage summaries were computed on the responses on recreational water frequency, type of recreational water use, and who accompanied youth to determine the changes from pre-intervention to post-intervention. The level of significance of 0.10 were used in both analyses where *p*-value of 0.10 or less will lead to determine significance of difference of scores at pre-/post-intervention.

Aim 2 was addressed by using descriptive statistics. Specifically, the mean and standard deviation of the scores for the perceived ease of use and perceived usefulness at the post-intervention were computed. Higher scores indicating higher acceptability.

Aim 3 was addressed by using cost descriptions. The costs associated in the development and implementation of the water safety prevention program were recorded and tabulated to provide a cost report.

Summary

This chapter described the methods and procedures utilized to assess the acceptability feasibility of a water safety education intervention among adolescents. Feasibility as defined by water safety knowledge, acceptability, and cost description of the intervention were analyzed using the Aquatic Recreation Knowledge-Attitudes-Behavior (KAB) Questionnaire (Moran, 2006), Technology Acceptance Questionnaire (TAQ) (Davis, 1989), and cost description. A

minimum of 25 students and 27 fire fighters and teachers will be purposefully recruited for the study. Descriptive analysis was conducted to determine the efficacy of the intervention (Aim 1), *t*-test with matched pairs were conducted to determine the acceptability of the intervention (Aim 2), and cost descriptions were identified to provide costing information of the intervention (Aim 3).

CHAPTER 4: RESULTS AND ANALYSIS

The purpose of this study was to examine the preliminary efficacy, acceptability, and cost of an adolescent water safety and drowning prevention intervention using a pre-experimental one-group pre-test/post-test design. Change in outcome measures (knowledge & perceived appropriateness) between data collection points was the main variables of interest. The specific aims for this study include as follows:

- Aim 1: Determine the preliminary effect of an adolescent-targeted water safety intervention on student's knowledge of safe open water practices;
- Aim 2: Determine ease of use of the intervention among firefighters and teachers delivering the intervention;
- Aim 3: Describe the cost of creating and implementing an adolescent-based open-water safety intervention.

Student Sample

The final sample of students consisted of 26 students. Table 5 summarized the demographic information, which includes gender, age, race/ethnicity, and how long each student lived in Arizona. For gender, all 26 students were females. Almost all of the 26 students were Caucasian (21; 80.8%). There were two Hispanic/Latino students, one Caucasian/Hispanic/Latino, one Indian, and one White student. The mean age among the 26 students was 15.75 years old (*SD* = 1.47). Almost all of the 26 students had lived in Arizona for more than 10 years (21; 80.7%).

TABLE 5. *Frequencies and percentages of demographic information of students (N = 26).*

	n	%
Gender		
Female	26	100.00%
Male	0	0.00%
Race/Ethnicity		
Caucasian	21	80.80%
Caucasian/Hispanic/Latino	1	3.80%
Hispanic/Latino	2	7.70%
Indian	1	3.80%
White	1	3.80%
4. How long have you lived in Arizona?		
3 to 4	3	11.50%
8 to 10	2	7.70%
> 10 years	21	80.70%
Age		
N	26	
Mean	15.75	
Std. Deviation	1.47	
Minimum	14.00	
Maximum	19.50	

Table 6 summarized the swimming background of the 26 students. All 26 students had been taught to swim while 16 (57.59%) students were taught through paid swimming lessons and 13 (50%) from parents/family. Only a few students or seven (26.90%) out of the 26 students had been taught water safety at school. Among these seven students, six (85.71%) had undergone the safety topic of pool safety, 3 (42.86%) had undergone open water or recreational water, and one (14.29%) had boat safety.

TABLE 6. *Frequencies and percentages of swimming background of students (N = 26).*

	n	%
5. Have you been taught to swim?		
Yes	26	100.00%
No	0	0.00%
If Yes, tick one circle which best describes who taught you		
Paid swimming lessons	15	57.69%
Parents/family	13	50.00%
6. Have you been taught water safety at school?		
No	19	73.10%
Yes	7	26.90%
If Yes, tick the safety topics you have been taught:		
Open water or recreational water safety	3	42.86%
Pool safety	6	85.71%
Boat safety	1	14.29%

Test of Normality of Data of Study Variables

Prior to conducting the analysis to address the research aims, the data of the dependent variable were analyzed to determine if the data followed normal distribution. The dependent variables involved in this independent sample *t*-test include level of knowledge, attitudes, and behaviors about water safety of the students. Normality was tested through an examination of the skewness and kurtosis statistics to check the distribution of the different dependent variable data. These are summarized in Table 7.

To determine whether the data follows a normal distribution, skewness statistics greater than three indicate strong non-normality and kurtosis statistics between 10 and 20 also indicate non-normality (Kline, 2005). As can be seen in Table 7, the skewness values (-0.19 to 0.88) and kurtosis (-0.27 to 0.92) statistic values of the different dependent variables were in the acceptable range enumerated by Kline (2005). Thus, all the data of the dependent variables exhibited normal distribution and did not violate the normality assumption.

TABLE 7. *Skewness and kurtosis statistics of study variables.*

	N	Skewness	Kurtosis
Knowledge (Composite Score)	50	0.48	-0.27
Attitudes (Composite Score)	50	-0.19	0.58
Behaviors (Composite Score)	52	0.88	0.92

Aim 1: Effect of Adolescent-Targeted Water Safety Intervention on Student's Knowledge, Attitudes, and Behaviors of Safe Open Water Practices

An independent sample *t*-test determined differences in the continuous measured scores of knowledge, attitudes, and behaviors about water safety of the students between pre-intervention and post-intervention. Also, a chi-square test of difference was conducted to determine difference in the categorical measured recreational water frequency, type of

recreational water use, and who accompanied youth between pre-intervention and post-intervention. A level of significance of 0.10 was used. Table 8 showed the descriptive statistics summaries of the scores for knowledge, attitudes, and behaviors about water safety of the students during the pre-intervention and post-intervention period.

TABLE 8. *Descriptive statistics summaries of knowledge, attitudes, and behaviors about water safety.*

	Post-test						
	N	**Mean**	**Std. Deviation**	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Knowledge (Composite Score)	26	4.08	1.83	24	4.21	1.67	0.34
Attitudes (Composite Score)	24	4.47	0.77	26	4.02	0.85	0.17
Behaviors (Composite Score)	26	5.66	2.62	26	5.22	2.21	0.43

Table 9 showed the results of the independent sample *t*-tests. The independent variable is the intervention while the dependent variables are knowledge, attitudes, and behaviors about water safety of the students. The results of the Levene's test for the independent sample *t*-test in Table 9 showed that the variance of all the dependent variables had *p*-values greater than the level of significance value of 0.10. Thus, the results in the "equal variances not assumed" row of the independent sample *t*-test result generated by SPSS were used.

Results of the independent sample *t*-test showed that there was only significance difference in the attitudes about water safety ($t(48) = 1.97$; $p = 0.06$) of the students between the pre-intervention and post-intervention ($p < 0.10$). These results showed that there is a significant change of attitudes about water safety of the students after they undergone the adolescent-targeted water safety intervention. Specifically, mean comparison showed that the students have better water safety attitudes ($M = 4.02$) during the post-intervention or after they undergone the adolescent-targeted water safety intervention as compared to the pre-intervention ($M = 4.47$) by a mean difference of 0.45. There are better water safety attitudes at the post-intervention because

lower score indicates better water safety attitudes in terms of being able to identify risk on water safety attitudes.

Also, results of the independent sample *t*-test showed that there were no significance differences in the knowledge ($t(48) = -0.27$; $p = 0.79$) and behaviors ($t(50) = 0.65$; $p = 0.52$) about water safety of the students between the pre-intervention and post-intervention ($p > 0.10$). These results showed that there is no significant change of knowledge and behaviors about water safety of the students after they undergone the adolescent-targeted water safety intervention. These results also meant that there was no effect found for the adolescent-targeted water safety intervention on these students' knowledge and behaviors of safe open water practices in this project.

TABLE 9. *Results of independent sample t-test of differences of knowledge, attitudes, and behaviors about water safety.*

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	*p.*	t	df	*p.* (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Knowledge (Composite Score)	Equal variances assumed	0.25	0.62	-0.27	48	0.79	-0.13	0.50	-1.13	0.87
Attitudes (Composite Score)	Equal variances assumed	0.02	0.89	1.97	48	0.06	0.45	0.23	-0.01	0.92
Behaviors (Composite Score)	Equal variances assumed	0.51	0.48	0.65	50	0.52	0.43	0.67	-0.92	1.78

Statistics related to students' swimming ability, rescue ability, CPR ability, risk perception on water safety attitudes, water safety attitudes, swimming at risk behaviors, and swimming at risk behaviors between pre-intervention and post-intervention

Table 10 shows the summaries of the data of recreational water frequency, type of recreational water use, and who accompanied youth of the student at the pre-intervention and post-intervention. Table 11 showed the results of the chi-square test to determine whether there is significant difference in the recreational water frequency, type of recreational water use, and who accompanied youth between the pre-intervention and post-intervention. Results exhibit that there was no significant difference in the recreational water frequency, type of recreational water use, and who accompanied youth between the pre-intervention and post-intervention ($p > 0.10$). These results showed that there is no significant change in the recreational water frequency, type of recreational water use, and who accompanied youth after the students undergone the adolescent water safety education intervention.

Looking at the post-intervention data, in terms of the swimming activity in the past year, majority of the students have often, quite often, or very often swam in home swimming pool (96.2%), public pool (69.2%), patrolled surf beach (88.4%), and lake, pond, water hole (84.5%). In terms of who accompanied the students when swimming, majority of the students mostly or always go with friends (69.2%) and parents/family (80.8%). In terms of the frequency of the type of recreational water use in the past year, majority of the students have often, quite often, or very often done Boating/sailing in a small craft (76.9%), paddling a canoe/kayak (73%), surfing (84%) and river rafting or tubing (64%). In terms of who accompanied the students when doing the different type of recreational water use, majority of the students mostly or always go with friends (69.2%) and parents/family (80.7%).

TABLE 10. *Frequency and percentage summaries of differences of recreational water frequency usage.*

			Period		Total
			Pre	Post	
9. In the past year have you been swimming in?					
Home swimming pool	0.0 Never	n	3	1	4
		%	11.50%	3.80%	7.70%
	1.0 Often	n	6	7	13
		%	23.10%	26.90%	25.00%
	2.0 Quite often	n	7	8	15
		%	26.90%	30.80%	28.80%
	3.0 Very often	n	10	10	20
		%	38.50%	38.50%	38.50%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%
Public pool (including school pool)	0.0 Never	n	6	8	14
		%	26.10%	30.80%	28.60%
	1.0 Often	n	12	12	24
		%	52.20%	46.20%	49.00%
	2.0 Quite often	n	2	3	5
		%	8.70%	11.50%	10.20%
	3.0 Very often	n	3	3	6
		%	13.00%	11.50%	12.20%
Total		n	23	26	49
		%	100.00%	100.00%	100.00%
Patrolled surf beach	0.0 Never	n	6	3	9
		%	23.10%	11.50%	17.30%
	1.0 Often	n	17	20	37
		%	65.40%	76.90%	71.20%
	2.0 Quite often	n	3	3	6
		%	11.50%	11.50%	11.50%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%
Surf beach without patrol	0.0 Never	n	11	13	24
		%	44.00%	50.00%	47.10%
	1.0 Often	n	13	12	25
		%	52.00%	46.20%	49.00%
	2.0 Quite often	n	1	1	2
		%	4.00%	3.80%	3.90%
Total		n	25	26	51
		%	100.00%	100.00%	100.00%
Flat water beach	0.0 Never	n	14	16	30
		%	53.80%	61.50%	57.70%
	1.0 Often	n	12	10	22
		%	46.20%	38.50%	42.30%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%

TABLE 10 – *Continued*

			Period		Total
			Pre	Post	
Lake, pond, water hole	0.0 Never	n	1	4	5
		%	3.80%	15.40%	9.60%
	1.0 Often	n	18	16	34
		%	69.20%	61.50%	65.40%
	2.0 Quite often	n	6	5	11
		%	23.10%	19.20%	21.20%
	3.0 Very often	n	1	1	2
		%	3.80%	3.80%	3.80%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%
River, creek, drain	0.0 Never	n	11	13	24
		%	44.00%	50.00%	47.10%
	1.0 Often	n	12	12	24
		%	48.00%	46.20%	47.10%
	2.0 Quite often	n	2	1	3
		%	8.00%	3.80%	5.90%
Total		n	25	26	51
		%	100.00%	100.00%	100.00%
10. Who did you go with?					
Friends	1.0 Sometimes	n	7	8	15
		%	26.90%	30.80%	28.80%
	2.0 Mostly	n	16	15	31
		%	61.50%	57.70%	59.60%
	3.0 Always	n	3	3	6
		%	11.50%	11.50%	11.50%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%
Parents/Family	1.0 Sometimes	n	7	5	12
		%	26.90%	19.20%	23.10%
	2.0 Mostly	n	15	17	32
		%	57.70%	65.40%	61.50%
	3.0 Always	n	4	4	8
		%	15.40%	15.40%	15.40%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%
On my own	0.0 Never	n	20	16	36
		%	76.90%	61.50%	69.20%
	1.0 Sometimes	n	6	10	16
		%	23.10%	38.50%	30.80%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%
School class/group (e.g., PE lesson/camp)	0.0 Never	n	22	24	46
		%	84.60%	92.30%	88.50%
	1.0 Sometimes	n	4	2	6
		%	15.40%	7.70%	11.50%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%

TABLE 10 – *Continued*

			Period		Total
			Pre	Post	
Organized group (e.g., church, scouts/guides)	0.0 Never	n	22	25	47
		%	84.60%	96.20%	90.40%
	1.0 Sometimes	n	4	1	5
		%	15.40%	3.80%	9.60%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%
Club member (e.g., swim/surf club)	0.0 Never	n	26	26	52
		%	100.00%	100.00%	100.00%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%
12. In the past year, have you done any of the following activities?					
Boating/sailing (in a small craft)	0.0 Never	n	8	6	14
		%	30.80%	23.10%	26.90%
	1.0 Often	n	16	17	33
		%	61.50%	65.40%	63.50%
	2.0 Quite often	n	2	2	4
		%	7.70%	7.70%	7.70%
	3.0 Very often	n	0	1	1
		%	0.00%	3.80%	1.90%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%
Yachting/boating (on a large craft)	0.0 Never	n	16	17	33
		%	61.50%	65.40%	63.50%
	1.0 Often	n	6	5	11
		%	23.10%	19.20%	21.20%
	2.0 Quite often	n	3	3	6
		%	11.50%	11.50%	11.50%
	3.0 Very often	n	1	1	2
		%	3.80%	3.80%	3.80%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%
Paddling (a canoe/kayak)	0.0 Never	n	5	7	12
		%	19.20%	26.90%	23.10%
	1.0 Often	n	18	16	34
		%	69.20%	61.50%	65.40%
	2.0 Quite often	n	3	3	6
		%	11.50%	11.50%	11.50%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%
Fishing (from a boat)	0.0 Never	n	15	17	32
		%	57.70%	65.40%	61.50%
	1.0 Often	n	11	8	19
		%	42.30%	30.80%	36.50%
	2.0 Quite often	n	0	1	1
		%	0.00%	3.80%	1.90%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%

TABLE 10 – *Continued*

			Period		Total
			Pre	Post	
Fishing (from the land)	0.0 Never	n	18	18	36
		%	69.20%	69.20%	69.20%
	1.0 Often	n	7	7	14
		%	26.90%	26.90%	26.90%
	2.0 Quite often	n	1	1	2
		%	3.80%	3.80%	3.80%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%
Surfing (Surfboard/Boogie board)	0.0 Never	n	7	4	11
		%	26.90%	16.00%	21.60%
	1.0 Often	n	15	20	35
		%	57.70%	80.00%	68.60%
	2.0 Quite often	n	2	0	2
		%	7.70%	0.00%	3.90%
	3.0 Very often	n	2	1	3
		%	7.70%	4.00%	5.90%
Total		n	26	25	51
		%	100.00%	100.00%	100.00%
River rafting, tubing	0.0 Never	n	11	9	20
		%	42.30%	36.00%	39.20%
	1.0 Often	n	12	12	24
		%	46.20%	48.00%	47.10%
	2.0 Quite often	n	1	1	2
		%	3.80%	4.00%	3.90%
	3.0 Very often	n	2	3	5
		%	7.70%	12.00%	9.80%
Total		n	26	25	51
		%	100.00%	100.00%	100.00%
Windsurfing/Jet skiing/Water skiing	0.0 Never	n	19	15	34
		%	73.10%	60.00%	66.70%
	1.0 Often	n	4	7	11
		%	15.40%	28.00%	21.60%
	2.0 Quite often	n	2	2	4
		%	7.70%	8.00%	7.80%
	3.0 Very often	n	1	1	2
		%	3.80%	4.00%	3.90%
Total		n	26	25	51
		%	100.00%	100.00%	100.00%
Underwater (Snorkeling/Scuba)	0.0 Never	n	13	14	27
		%	50.00%	56.00%	52.90%
	1.0 Often	n	8	10	18
		%	30.80%	40.00%	35.30%
	2.0 Quite often	n	5	1	6
		%	19.20%	4.00%	11.80%
Total		n	26	25	51
		%	100.00%	100.00%	100.00%

TABLE 10 – *Continued*

			Period		Total
			Pre	Post	
13. Who did you go with?					
Friends	0.0 Never	n	1	1	2
		%	3.80%	3.80%	3.80%
	1.0 Sometimes	n	10	7	17
		%	38.50%	26.90%	32.70%
	2.0 Mostly	n	13	17	30
		%	50.00%	65.40%	57.70%
	3.0 Always	n	2	1	3
		%	7.70%	3.80%	5.80%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%
Parents/Family	0.0 Never	n	1	0	1
		%	3.80%	0.00%	1.90%
	1.0 Sometimes	n	4	5	9
		%	15.40%	19.20%	17.30%
	2.0 Mostly	n	17	16	33
		%	65.40%	61.50%	63.50%
	3.0 Always	n	4	5	9
		%	15.40%	19.20%	17.30%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%
On my own	0.0 Never	n	17	18	35
		%	65.40%	69.20%	67.30%
	1.0 Sometimes	n	9	8	17
		%	34.60%	30.80%	32.70%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%
School class/group (e.g., PE lesson/camp)	0.0 Never	n	25	25	50
		%	96.20%	96.20%	96.20%
	1.0 Sometimes	n	1	1	2
		%	3.80%	3.80%	3.80%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%
Organized group (e.g., church, scouts/guides)	0.0 Never	n	25	25	50
		%	96.20%	96.20%	96.20%
	1.0 Sometimes	n	1	1	2
		%	3.80%	3.80%	3.80%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%
Club member (e.g., swim/surf club)	0.0 Never	n	26	26	52
		%	100.00%	100.00%	100.00%
Total		n	26	26	52
		%	100.00%	100.00%	100.00%

Summaries related to type of recreational water use and who accompanied youth between pre-intervention and post-intervention.

TABLE 11. *Results of chi-square test of differences of recreational water frequency usage.*

	Pearson Chi-Square Value	df	*p*. (2-sided)
9. In the past year have you been swimming in?			
Home swimming pool	1.14	3	0.77
Public pool (including schoolpool)	0.30	3	0.96
Patrolled surf beach	1.24	2	0.54
Surf beach without patrol	0.19	2	0.91
Flat water beach	0.32	1	0.58
Lake, pond, water hole	2.01	3	0.57
River, creek, drain	0.48	2	0.79
10. Who did you go with?			
Friends	0.10	2	0.95
Parents/Family	0.46	2	0.80
On my own	1.44	1	0.23
School class/group (e.g. PE lesson/camp)	0.75	1	0.39
Organized group (e.g. church, scouts/guides)	1.99	1	0.16
Club member (e.g. swim/surf club)	No statistics re computed because Club member (e.g. swim/surf club) is constant		
12. In the past year, have you done any of the following activities?			
Boating/sailing (in a small craft)	1.32	3	0.73
Yachting/boating (on a large craft)	0.12	3	0.99
Paddling (a canoe /kayak)	0.45	2	0.80
Fishing (from a boat)	1.60	2	0.45
Fishing (from the land)	0.00	2	1.00
Surfing (Surfboard/Boogie board)	3.85	3	0.28
River rafting, tubing	0.38	3	0.94
Windsurfing/Jet skiing/Water skiing	1.27	3	0.74
Underwater (Snorkelling/Scuba)	2.91	2	0.23
13. Who did you go with?			
Friends	1.40	3	0.71
Parents/Family	1.25	3	0.74
On my own	0.09	1	0.77
School class/group (e.g. PE lesson/camp)	0.00	1	1.00
Organized group (e.g. church, scouts/guides)	0.00	1	1.00
Club member (e.g. swim/surf club)	No statistics are computed because Club member (e.g. swim/surf club) is a constant		

Results related to type of recreational water use, and who accompanied youth between pre-intervention and post-intervention.

Aim 2: Acceptability and Feasibility of an Adolescent Water Safety Education Intervention

Descriptive statistics summaries were conducted to address research question two to determine the acceptability and feasibility of the intervention among firefighters and teachers delivering the intervention. Table 12 shows the central tendency measures of mean and standard

deviation were used to summarize the continuous measured scores of perceived usefulness and perceived ease of use of an adolescent water safety education intervention. For the perceived usefulness an adolescent water safety education intervention, the mean score of the 14 items measuring perceived usefulness was 4.84 (*SD* = 0.62) was between the "4 = somewhat agree" and "5 = agree" scales which indicate that perceived usefulness of an adolescent water safety education intervention was in the above average levels.

For the perceived ease of use an adolescent water safety education intervention, the mean score of the 14 items measuring perceived ease of use was 4.83 (*SD* = 0.79) was also between the "4 = somewhat agree" and "5 = agree" scales which indicate that perceived ease of use of an adolescent water safety education intervention was also in the above average levels. Thus, there were good levels of perceived usefulness and perceived ease of use of an adolescent water safety education by the firefighters and teachers undergone the intervention.

TABLE 12. *Firefighters' and teachers' perceived usefulness and perceived ease of use of an adolescent water safety education intervention*.

	N	Mean	Std. Deviation	Minimum	Maximum
Perceived Usefulness	28	4.84	0.62	3.29	6.00
Perceived Ease of Use	28	4.83	0.79	3.14	5.86

Aim 3: Cost Analysis of Implementing an Adolescent-Based Open Water Safety Intervention

The cost analysis for conducting the data collection and analysis for this study, the total cost was $2,047.65. It should be noted that the firefighters, teachers, and students volunteered their time to participate in the survey process. They were provided with gift cards because of their participation. The breakdown of the costs was as follows: Video cost was $800, editing cost was $500, printing cost of the survey was $187.65 and gift cards were $560.

Summary

The purpose of this quantitative study was to examine preliminary efficacy, acceptability, and cost of an adolescent water safety and drowning prevention intervention using a pre-experimental one-group pre-test/post-test design. Results of the independent sample *t*-test showed that there is a significant change only in the attitude about water safety of the students from pre-intervention to post-intervention or after the students undergone the adolescent-targeted water safety intervention. However, there was no significant difference in the knowledge and behaviors about water safety of the students between pre-intervention and post-intervention. Also, there was no significant difference in the recreational water frequency, type of recreational water use, and who accompanied youth between the pre-intervention and post-intervention. Thus, the adolescent-targeted water safety intervention has no significant effect on recreational water frequency, type of recreational water use, who accompanied youth, and students' knowledge of safe open water practices. However, there were positive evaluations of feasibility and perceived ease of use of an adolescent water safety education. Chapter five is a discussion of finding from the study as they relate to literature, implications for action, and recommendations for future research.

CHAPTER 5: DISCUSSION

This chapter includes a discussion of the findings, implications of these findings, limitations of the study, and recommendations for future research. The findings showed that exposure to targeted water safety intervention tested in this study did in fact change students' attitudes about water safety, in addition to achieving wide acceptability of the program among firefighters and high school teachers. There were also therefore positive perceptions among firefighters and teachers of the feasibility and ease of use of this adolescent water safety program.

These findings of the current study demonstrated that that increased education did change attitudes, however, behaviors towards water activity, and knowledge were not changed also. Additionally, the findings suggested there was much more to be discovered about what truly influences water safety beliefs for adolescents. Moreover, the hypothesis that SCT framework would serve as a reasonable solution to change a person's skills, attitudes and behavior by way of increased knowledge ultimately was not supportive for the current study.

The hypothesis was based upon previous research and SCT framework that a water safety education intervention program would increase the knowledge required to limit risky behaviors involving water. What the current study revealed, however, was that the behavior of adolescents were not substantially changed by the administration of such a short video program. Although it was predicted that swimming knowledge regarding swimming safety and skill would reduce the potential for drowning, research findings suggested that improved swimming skills was an area of minimal impact. One potential reason for the lack of significant findings could have been that the intervention applied in the research consisted only of a video and a lecture. A more

efficacious intervention may have to include more hands-on engagement, such as swimming lessons or other skill building techniques. Determining the appropriate intervention could yield a more positive outcome.

Effects of Adolescent-Targeted Water Safety Intervention

The basis of the current research study was rooted in the belief that most drowning events could be easily avoided within the framework of measured actions (Weiss, 2010). According to one study, 85% of drowning events could be prevented with preventative efforts such as supervision, swimming instruction, technology, regulation, and public education (Austin & Macintosh, 2013). In contrast to the findings of this study that found there was no correlation between safety education knowledge and beliefs and behaviors. Opposite of the finding of this study, Lawson et al. (2012); Soloman, Giganti, Weiner, and Akpinar-Elci (2012); and Terzidis, Koutroumpa, Skalkidis, Matzavakis, Malliori, Frangakis, DiScala, and Petridou, (2007); all found there was an increase in water safety knowledge following the educational intervention. The cause of variance, therefore, for the intervention applied in the current study could have been due to the specific methods used. More specifically, the current study used a video and a lecture. A more hands on approach could be more appropriate for changing risk behaviors related to water safety intervention. Terzidis, Koutroumpa, Skalkidis, Matzavakis, Malliori, Frangakis, DiScala, and Petridou (2007) additionally, found there to be minimal improvement in behavioral change regarding water safety for adolescent children. This finding was therefore more relevant to the current results because it validated the need for the current research to be conducted for the purpose of exploring adequate intervention measures that would potentially impact water safety for adolescents. One major difference between the current study and previous research that could

explain the difference was that the method used in the present study consisted only of a video and a lecture whereas previous research referenced some hands-on water safety measures such as swim lessons.

A second hypothesis of the current study was on the perceived impact of swimming lessons. Although participants did not receive swimming lessons they were surveyed on descriptive statistic recreational water frequency, type of recreational water use, and who accompanied the youth was assessed in questions 9, 10, 12, and 13. Moreover, five questions assessed water safety knowledge including: swimming ability (question 17), rescue ability (question 18), CPR ability (question 19), and boating safety knowledge (questions 24 & 25). Water safety attitudes were also evaluated through risk perception (question 20) and attitudes (question 23). Finally, behaviors were measured via swimming at risk behaviors (questions 11 & 14). In accordance with SCT framework and the literature for the current study, there was a common assumption that increased knowledge would thus impact the beliefs and attitudes regarding water safety for adolescent youth. However, the current study revealed this to not be the case; such findings coincide with the American Academy of Pediatrics (2010), who stated with a policy that swimming lessons at a very young age only provide parents with false sense of security and do not reduce drowning in any way. Petrass and Blitvich (2014) also found there to be no correlation between previous formal swimming lessons and reduced fatalities. Validating their study, they utilized different aquatic environments, which allowed them to generalize findings to open-body water settings. Their targeted age group also consisted of older groups thus making it more appropriate and relatable to the current study. One limitation of their study, however, was their use of a 12-week program that utilized numerous methods within the

intervention, which made it difficult to pin point any one part of the intervention and change in behaviors. However, costs, length of time, and outreach through the use of the school were a strength of the study.

The current study's findings add to the very limited literature specifically address the older child and the adolescent. Due to research showing that children and adolescents are the most likely to be victims of drowning incidents (CDC, 2012), there is therefore a very significant need for research to ensure adolescents are included. Other studies also consisted of small sample sizes within age groups. In support of the findings of this current study, previous studies were inconsistent in determining the effects of the intervention and whether it brought forth a behavioral change among participants and overall decrease in drowning rates. Also making this study different is that it was performed in the United States. All but three of the studies found on this subject were conducted outside the US. One US study on water safety and drowning intervention proved to be limited as it only covered six US states. Factors like varying regulations and laws such as pool fences, boating laws, and life vest use can drastically impact the data.

Geographical and climate adjustments also present altered data from water convenience and exposure for drowning risk. This climatic variation tends to impact the number of pools per capita and/or water recreational activities. For example, a cold environment is much less likely to have pools in the average home or the ability to use open-bodied water recreationally. On the contrary, Florida is an environment where a home pool or large body of water is accessible to mostly everyone (Brenner, Taneja, Haynie, Trumble, Qian, Klinger, & Klebanoff, 2009; Lawson

et al., 2012). In other terms, this study did not take into account the prevalence of threat to drowning incidents as it related to the presence of water and geographic factors.

Acceptability and Feasibility of Interventions

As it related to the construct of adolescent water safety knowledge attainment, the current study addressed the question of whether a water safety program would impact beliefs and behaviors regarding water. As a result, the current study found the perceived benefit of a water safety intervention program to be high. In line with SCT framework that a water safety program might decrease drowning, firefighters and teachers in the study also held the belief that such programs could be of benefit in their communities. As for what could have been done differently, the research could have consisted of more hands-on intervention and water safety instruction as opposed to having participants watch a video followed by verbal instruction.

Implications of Findings

At the outset of the study, it was presumed that the findings would reveal a substantial outcome on the influence of water safety intervention among adolescents between the ages of 14 and 19. Instead it was determined that there was no correlation between intervention strategies applied in this research and changed beliefs and attitudes regarding water safety. This finding was in line with previous research and even with the American Academy of Pediatrics who determined that such a belief only provides parents a false sense of hope. Therefore, a primary implication of the findings is that it is necessary for researchers to conduct more research on measures that can indeed impact the rates at which drowning occurs. Determining this would have tremendous impact on various levels: individual, family, and societal. Following, is a discussion of each.

Individual

Individually, this research could be impactful in the way of education on how to protect oneself. If appropriate measures can be found that will equip young adults with the tools to be safe around water, it would not only reduce drowning rates but it would also give them the skills and tools on how they can help keep others around them safe (Petrass & Blitvich, 2014).

Family

Determining what ultimately makes the difference also impacts the family in that it could allow parents to ensure their children are provided that which is necessary to remain safe (Petrass & Blitvich, 2014).

Societal

Lastly, there is the societal component. Perhaps intervention should do a better job targeting older children as opposed to focusing only on younger children. Every year hundreds of thousands of adolescents worldwide fall victim to drowning incidents. If implementation of future research can save the lives of just a few, it would be worth it (Wallis, Watt, Franklin, Taylor, Nixon, & Kimble, 2015).

Ultimately, the goal of the research was to determine the effectiveness and impact of Water Safety intervention for the purpose of possibly reducing drowning rates. Future research that truly identifies what works best would help achieve that outcome. Such research will be discussed in a subsequent section.

Theory

The guiding theory for the current study was the social cognitive theory (SCT), a behavioral interpersonal theory focused on self-efficacy and self-regulation of behavior by way

of interventions that prepare the individual's skills, attitudes, and self-beliefs with emphasis on social influence and learning (Bandura, 1989; Borgersen, 2014, 2015). Where the SCT and the current study did not achieve agreement was the finding of the current study that showed there to be no direct link between the prevention measures applied in this study and changed beliefs and attitudes towards water safety among adolescent youth. Therefore, the current research study did not find the water safety intervention to impact attitudes towards water safety.

Also, the underlying social constructivism paradigm in this theory provides a view of how social influence and learning impacts schemata and outcome behaviors (Bandura, 1989, 2004; Piaget, 1952; Borgersen, 2015). SCT, therefore, involves interpretability of concepts that are manipulated with an intervention to bring forth knowledge attainment and behavioral change (Fisher & Fisher, 2000; Bandura, 1989, 2004; Borgersen, 2015). It may have also been illuminating if the current study would have measured some of these other factors such as self-efficacy and operant conditioning.

The findings for the current study are, therefore, inconsistent with the literature review and are not in alignment with the theory guiding the current study. Further, this is important because it demonstrates the potential presence of alternative solutions to increase knowledge and awareness regarding water safety among adolescent youth. Although there was an abundance of research suggesting this belief, the findings revealed something slightly different. It would appear that geographic and demographic differences along with data gaps played a role in the discrepancy between the results and the research.

Due to the lack of correlation between SCT theory, the research and the actual findings of the current study regarding water safety, implications would seem to suggest that the wrong

variables were considered. For example, instead of looking at swimming skills and knowledge about safety as ultimate variables for prevention, there was and is a need for research to explore and discover other critical variables. Implications could also involve finding ways to draw data from larger and wider ranging audiences. In doing so, the findings could prove to be vastly different than those found in the current study. The findings also seem to suggest there to be a need to partner more with first responders and firefighters for solutions in regards to education and safety measures.

Practice

This research and future research that builds upon it is particularly useful to those who aid in its prevention. Firefighters, paramedics, educators and parents can all benefit from not only knowing the findings but in applying the findings because each of these groups of individuals have a vested interest in the lowering of drowning rates amongst children. This current research could also be a good start to a pressing conversation across the country, because, although the measures used in this study did not prove to be most effective, conversations could lead to ideas on better intervention measures. This leaves a need for there to be future practice that capitalizes on the current research study by discovering and employing more effective strategies and developing programs and solutions that involve the key stakeholders in this issue.

There is also a difference between perceived and actual results that should be considered. In the current study there was a perceived benefit of effectiveness among firefighters that was contradictive to the actual results. More specifically, firefighters assumed that the water safety program would yield positive results. Improved practice would also consist of doing a better job of defining success in this area. More lives would be changed as a result and it would greatly

impact the way water safety education is approached. Even the introduction of new and innovative kinds of equipment devices could be introduced to the market. Such equipment and devices could prove to be beneficial in efforts to reduce the drowning rates and be applied across the US. Whatever the case, increased knowledge and the measures taken for this particular study did not prove to be the answer.

DNP Essentials

This study fulfills all foundational competencies as outlined by the American Association of Colleges of Nursing (AACN) for the Doctor of Nursing Practice (DNP) education for advanced nursing practice:

Essential I (*Scientific Underpinnings for Practice*) – is demonstrated by the use of a science-based theory, SCT, to develop the water safety intervention and predict outcomes based off of human behavior and encouraging positive changes.

Essentials II and V (*Organizational and Systems Leadership for Quality Improvement*; *Health Care Policy for Advocacy in Health Care*) – are displayed by a combination of organizational (fire department and high school), clinical (adolescent water morbidity and mortality), and economic (cost analysis) sciences to influence current and future water safety needs of adolescents ages 14-19 years. Additionally, application of the multiorganizational fire department and high school policies proposes the initiative and advocacy for potential health policy improvement for adolescents overall.

Essential III (*Clinical Scholarship and Analytical Methods for Evidence-Based Practice*) – is demonstrated by the review of existing literature to identify gaps and the need for an adolescent water safety intervention to improve healthcare outcomes.

Essential IV (*Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care*) – is established by the development and implementation of an adolescent age appropriate water safety video for healthcare quality improvement.

Essential VI (I*nterprofessional Collaboration for Improving Patient and Population Health Outcomes*) – is demonstrated the contribution of interprofessional teams from the fire department and high school to create change.

Essential VII (*Clinical Prevention and Population Health for Improving the Nation's Health*) – is exhibited via the analyzed data used to identify adolescent drowning as a population health disparity and the need for risk reduction.

Essential VIII (*Advanced Nursing Practice*) – is displayed by the complete conceptual and analytical analysis required to link an adolescent water safety need, development of a water safety intervention based off of science-based theory and evidence-based exiting literature, implementation of the intervention with interprofessional/multiorganizational teams and policies, and the overall partnerships with the students and professionals to facilitate positive outcomes (AACN, 2006).

Limitations of the Study

This study is limited by the lack of its generalizability having a sample size of just 26 students. This is, however, not uncommon with pilot studies. Moreover, with there being an abundance of factors to consider such as laws, regulations, pool per capita, number of open-bodies of water, etc., there are simply too many variables that this study could not account for. There is an inherent need to increase the scope of this subject to truly discover outcomes that

would have similar impact in Washington D.C. as it does in Florida. Thus, the intervention applied was not sufficient for wide application without further refinement. Such alterations to this studies like this one could include application in other geographic environments. Another limitation of the current study is the sample size. There were simply not enough individuals surveyed to make wide-ranging conclusions either way. The limitations described manifested in the following areas:

The current study intervention consisted of having participants watch a short video followed by verbal instruction regarding water safety. The idea was that students were much more likely to learn from a video than they would traditional instruction. Technology use was particularly used in this study due to previous research suggesting it to be a potentially effective means for impacting water safety attitudes (Austin & Macintosh, 2013). It would have possibly been more appropriate to take this thinking a step further to make the engagement more hands on.

Recommendations for Future Research

As more adolescents become casualties to drowning incidents there will subsequently remain a need for more research to be conducted. So little is truly known about preventing said incidents is a cause for concern, which is why more wide-ranging research is needed. For so much to have been said about drowning incidents and prevention, there is yet so little that is truly known about how such incidents can be prevented.

Future research studies should use rigorous research methods to validate and build upon the surprising results of this investigation. Forthcoming research might consider the following questions:

- What are the universal variables, regardless of demographic and geographic regions that directly correlate with water safety?
- What are the best mediums and strategies that can be used to reduce water related incidents for adolescents between ages of 14 and 19 years old?
- How are the best strategies the same across ages? How are they different across ages?
- In what ways can schools, community entities, first responders and parents partner together to design strategies that help reduce water safety incidents across the country?

Numerous questions remain concerning what truly works and what doesn't when it comes to the prevention of water related fatalities. What is certain, however, is that something has to be done to reduce the rates of an issue that is so preventable. It is true that things like swimming techniques and water safety knowledge helps, but it is also suggested in the current research study that the impact is virtually non-existent. It is, therefore, necessary that future research is conducted to explore ways to prevent the avoidable tragedy of so many water related fatalities. Without such endeavors, it is only assumed that the rates will continue to rise.

Strengths

There were also several strengths revealed through the present study. First, there was the concept of a novel intervention. Secondly, the research thrived due to the presence of stakeholders that were involved and committed. Finally, the study was based on the prevention of a vulnerable group experiencing greater fatalities in the form of drowning.

Conclusion

In light of research on drowning rates among adolescent youth, this study sought to address a research gap regarding a lack of awareness on the correlation between knowledge and

behaviors/attitudes towards water safety. With hundreds of thousands of adolescents losing their lives each year, this quantitative study explored the knowledge, acceptability, feasibility and cost of an adolescent water safety and drowning prevention intervention using a pre-experimental one-group pre-test/post-test design. The expectations of this study were to determine the relation between prevention strategies and drowning rates and possible applications for solving the issue at hand. However, it was instead found that such a relation did not exist. More research must be conducted in order to begin understanding further how factors such as knowledge impact attitudes and water behavior.

APPENDIX A:

THE UNIVERSITY OF ARIZONA INSTITUTIONAL REVIEW BOARD (IRB) APPROVAL LETTER

Research
Office for Research & Discovery

Human Subjects
Protection Program

1618 E. Helen St.
P.O.Box 245137
Tucson, AZ 85724-5137
Tel: (520) 626-6721
http://rgw.arizona.edu/compliance/home

Date: January 17, 2018
Principal Investigator: Wendy Lynn Ojeda
Protocol Number: 1711063167
Protocol Title: Water Safety Intervention for Adolescents Aged 14-19 Years
Level of Review: Exempt
Determination: Approved

Documents Reviewed Concurrently:

Data Collection Tools: *KABquestionnaire.docx*
Data Collection Tools: *TECHNOLOGY ACCEPTANCE QUESTIONNAIRE.docx*
HSPP Forms/Correspondence: *Appendix AChildren EDIT 122017.DOC*
HSPP Forms/Correspondence: *Application for Human Research-2 EDIT 122017-2.doc*
HSPP Forms/Correspondence: *F107.doc*
HSPP Forms/Correspondence: *Signature page.pdf*
Informed Consent/PHI Forms: *Assent Form.docx*
Informed Consent/PHI Forms: *Assent Form.pdf*
Informed Consent/PHI Forms: *ICF 19 year old.docx*
Informed Consent/PHI Forms: *ICF 19 year old.pdf*
Informed Consent/PHI Forms: *Parental Permission Form EDIT 122017.DOCX*
Informed Consent/PHI Forms: *Parental Permission Form EDIT 122017.pdf*
Informed Consent/PHI Forms: *Permission for research participation Firefiighters and Teachers.docx*
Informed Consent/PHI Forms: *Permission for research participation Firefiighters and Teachers.pdf*
Other Approvals and Authorizations: *Support Letters.docx*
Protocol: *Intervention Protocol.docx*
Protocol: *WaterSafetyScript.docx*
Recruitment Material: *FDflyer EDIT 122017.DOCX*
Recruitment Material: *Recruitment Letter EDIT 122017.DOCX*

This submission meets the criteria for exemption under 45 CFR 46.101(b). This project has been reviewed and approved by an IRB Chair or designee.

- The University of Arizona maintains a Federalwide Assurance with the Office for Human Research Protections (FWA #00004218).
- All research procedures should be conducted according to the approved protocol and the policies and guidance of the IRB.
- Exempt projects do not have a continuing review requirement.
- Amendments to exempt projects that change the nature of the project should be submitted to the Human Subjects Protection Program (HSPP) for a new determination. See the Guidance

APPENDIX B:

BOULDER CREEK HIGH SCHOOL LETTER OF SUPPORT

September 23, 2016

Mariette Marsh
Human Subjects Protection Program
University of Arizona
P.O. Box 210409
Tucson, AZ 85721

Dear Ms. Marsh:

It is my pleasure write a letter in support of the "Unintentional Open Water Drowning in Adolescents Aged 14 to 19" proposal being submitted to the University of Arizona HSPP by Wendy Borgersen and the University of Arizona College of Nursing.

Drowning in Arizona is an unfortunate disparity, largely impacting our adolescent cohort. Boulder Creek High School supports prevention programs of adolescent injury and mortality. Far too often, it is overlooked that a staggering number of drownings are not the young child, nor the child in a pool setting. We are excited at the prospect of implementing an intervention targeted to open water drowning among the adolescent population through education. We would be pleased to collaborate with Daisy Mountain Fire Department to utilize a water safety program in partnership with Wendy Borgersen and the University of Arizona.

In conclusion, I fully support the efforts of Wendy Borgersen and the University of Arizona College of Nursing as they seek community stakeholder cooperation and participation to support a program designed to reduce adolescent drowning. Any program that can help adolescents become aware and improve water safety will benefit students, their families, healthcare services, and our community as a whole.

Sincerely,

Lauren Sheahan

Lauren Sheahan
Principal Boulder Creek High School

APPENDIX C:

DAISY MOUNTAIN FIRE DEPARTMENT LETTER OF SUPPORT

DAISY MOUNTAIN FIRE DISTRICT
515 E. CAREFREE HWY., PMB #385, PHOENIX, ARIZONA 85085
PHONE (623) 465-7400 FAX (623) 465-7632

September 1, 2016

Mariette Marsh
Human Subjects Protection Program
University of Arizona
P.O. Box 210409
Tucson, AZ 85721

Dear Ms. Marsh:

It is my pleasure write a letter in support of the "Unintentional Open Water Drowning in Adolescents Aged 14 to 19" proposal being submitted to the University of Arizona HSPP by Wendy Borgersen and the University of Arizona College of Nursing.

The Daisy Mountain Fire Department is continuously seeking outlets to educate the public in an effort to reduce or prevent water related incidents. In an ongoing effort to bring awareness to the communities that we serve as well as the state of Arizona, we are pleased to partner with Wendy Borgersen and the University of Arizona College of Nursing. Often times, drowning incidents and awareness focus on pediatric age incidents. Drownings can happen at all ages and I am eager to expand our education and bring awareness to such a meaningful topic. As an experienced first responder, I have seen the devastating impact that a drowning can have on the families, bystanders and even rescuers involved. As an EMS provider, Daisy Mountain Fire Department is committed to community education with the intent of preventing such emergencies and encouraging safety.

In conclusion, I fully support the efforts of Wendy Borgersen and the University of Arizona College of Nursing as they seek community stakeholder cooperation and participation to support a program designed to reduce adolescent drowning. Any program that can help adolescents become aware and improve water safety will benefit students, their families, healthcare services, and our community as a whole.

Sincerely,

Dave Wilson
Battalion Chief
Daisy Mountain Fire Department

APPENDIX D:

INFORMATIONAL LETTER

Recruitment Letter

I am working with your local fire department and high school to conduct a research study for adolescent water safety.

I am recruiting students to participate in a 1 session class that teaches recreational water safety in adolescents. The class will consist of a video made by their peers and fire department personnel, and a classroom lecture type of verbal educational water safety material delivered by the local fire department and high school teachers. The information will be administered during normal PE class and will take approximately 45 minutes. The goal of the water safety information is to provide adolescents recreational water safety knowledge, and perhaps decrease the incidence of unintentional adolescent drowning in the long-term. Before and after video and lecture, the students will be asked to complete a survey to compare water safety knowledge gain.

Your child's participation in this study is voluntary. If you decide to participate, you may withdraw at any time. Your participation in the study or withdrawal from participation will not affect your child's PE grade. Also confidentially of all data collected for this study will be maintained at all steps of the study. If you and your child are willing to participate, please sign and return the attached consent form to the child's PE teacher. Note that children without consent will not be permitted to participate in the adolescent drowning prevention intervention.

If you have any questions concerning the research study, please call me at (520) 395-5340 or by way of email: wojeda@email.arizona.edu

An Institutional Review Board responsible for human subjects research at The University of Arizona reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

Thank you for your consideration

Wendy Borgersen, MSN, CPNP, DNP/PhD Candidate

APPENDIX E:

FIREFIGHTER/TEACHER INFORMED CONSENT FOR PARTICIPATION

The University of Arizona Permission For Your Participation in Research

Study Title: Acceptability and Feasibility of a Water Safety Intervention for Adolescents Aged 14-19 Years

Principal Investigator: Wendy Borgersen, MSN, NP

This is a permission form for research participation.
It contains important information about this study and what to expect if you decide to participate. Please consider the information carefully. Feel free to discuss the study with your friends and family and to ask questions before making your decision.
Participation is completely voluntary. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled, and you may discontinue participation at any time without penalty or loss of benefits.

Why is this study being done?

The study is conducted to test the effects and feasibility of an adolescent water safety intervention in reducing unintentional recreational drowning in adolescents.

How many people will take part in this study?
Up to 50 students and at least 27 firefighters and teachers will be included in the study.

What will happen if I take part in this study?
Firefighters and teachers will be asked to participate in the production of an adolescent water safety video and/or delivery of the educational materials and video in a High School physical education class. Additionally, firefighter and teacher participants will be asked to complete a survey at the completion of their participation. The survey will assist in determining the feasibility of continuing a water safety intervention for adolescents.

How long will I be in the study?
Video development and production will be conducted during a one-day filming at Lake Pleasant. All efforts will be made to perform video development on the participant's crew schedule, but personal time may be volunteered if the participant would like to take part in the video. The video implementation will be conducted during a PE class during the weekday between 0800 and 1500, and total intervention application will last approximately 1 hour and 5 minutes. Participants may choose to partake in either or both intervention development and/or implementation, and will be asked to complete a survey.

Can I stop being in the study?
Your participation is voluntary. You may refuse participation in this study. If you take part in the study, you may decide to leave the study at any time. No matter what decision you make, there will be no penalty to you and neither will you lose any of your usual benefits. Your decision will not affect your future relationship with Boulder Creek High School, Daisy Mountain Fire Department, or The University of Arizona.

What risks, side effects or discomforts can I expect from being in the study?
The study poses no more than minimal risk. You may experience boredom, stress and fatigue.

What benefits can I expect from being in the study?
Benefits include public safety delivery to a population in need of water safety efforts.

Will my study-related information be kept private?
Efforts will be made to keep your study-related information confidential. Your records may be reviewed by the following groups:
Office for Human Research Protections or other federal, state, or international regulatory agencies
The University of Arizona Institutional Review Board or Office of Responsible

What are the costs of taking part in this study?
Aside from your time, there are no costs for taking part in the study.

Will I be paid for taking part in this study?
You will receive a $10 retail gift card

What are my rights if I take part in this study?
If you choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights you may have as a participant in this study. You will be provided with any new information that develops during the course of the research that may affect your decision whether or not to continue participation in the study. You may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. An Institutional Review Board responsible for human subjects research at The University of Arizona reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

Who can answer my questions about the study?
For questions, concerns, or complaints about the study you may contact the Principle Investigator, Wendy Borgersen, MSN, NP at (520)395-5340.

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact the Human Subjects Protection Program at 520-626-6721 or
https://rgw.arizona.edu/compliance/human-subjects-protection-program

I have read (or someone has read to me) this form and I am aware that I am being asked to provide permission to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study. I am not giving up any legal rights by signing this form.

_____
Printed name of subject

_____
Signature of subject

Date

APPENDIX F:

STUDENT INFORMED CONSENT FOR PARTICIPATION

The University of Arizona Parental Permission For Your Participation in Research
Study Title: Acceptability and Feasibility of a Water Safety Intervention for Adolescents Aged 14-19 Years
Principal Investigator: Wendy Borgersen, MSN, NP

This is a parental permission form for research participation.
It contains important information about this study and what to expect if you decide to participate. Please consider the information carefully. Feel free to discuss the study with your friends and family and to ask questions before making your decision.
Participation is completely voluntary. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled, and you may discontinue participation at any time without penalty or loss of benefits.
Why is this study being done?

The study is conducted to test the effects and feasibility of an adolescent water safety intervention in reducing unintentional recreational drowning in adolescents.

How many people will take part in this study?
Up to 50 students will be included in this study.

What will happen if I take part in this study?
Your local fire department and PE teacher will provide an open water safety video for adolescents. You will be asked to fill out a survey before and after the video. The survey will assist in determining a change in water safety knowledge, providing insight to future feasibility for continuing a water safety intervention for adolescents.

How long will I be in the study?
The study will be conducted during your routinely scheduled PE class, and will last approximately 1 hour and 5 minutes.

Can I stop being in the study?
Your participation is voluntary. You may refuse participation in this study. If you take part in the study, you may decide to leave the study at any time. No matter what decision you make, there will be no penalty to you and neither will you lose any of your usual benefits. Your decision will not affect your future relationship with Boulder Creek High School or The University of Arizona.

What risks, side effects or discomforts can I expect from being in the study?
The study poses no more than minimal risk. You may experience boredom, stress and fatigue.

What benefits can I expect from being in the study?
Benefits include increased open water safety knowledge.

Will my study-related information be kept private?

Efforts will be made to keep your study-related information confidential. Your records may be reviewed by the following groups:
Office for Human Research Protections or other federal, state, or international regulatory agencies
The University of Arizona Institutional Review Board or Office of Responsible

What are the costs of taking part in this study?
Aside from your time, there are no costs for taking part in the study.

Will I be paid for taking part in this study?
You will receive a $10 retail gift card

What are my rights if s/he takes part in this study?
If you choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights you may have as a participant in this study. You will be provided with any new information that develops during the course of the research that may affect your decision whether or not to continue participation in the study. You may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. An Institutional Review Board responsible for human subjects research at The University of Arizona reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

Who can answer my questions about the study?
For questions, concerns, or complaints about the study you may contact the Principle Investigator, Wendy Borgersen, MSN, NP at (520)395-5340.

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact the Human Subjects Protection Program at 520-626-6721 or
https://rgw.arizona.edu/compliance/human-subjects-protection-program

I have read (or someone has read to me) this form and I am aware that I am being asked to provide permission to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study. I am not giving up any legal rights by signing this form.

_____
Printed name of subject

_____
Signature of subject Date

APPENDIX G:

PROMOTIONAL FLYER

PROVIDED BY YOUR LOCAL FIRE AND RESCUE DEPARTMENT

Be WATER WISE!

Educate Prepare Prevent

TEENAGE DROWNING

- Drowning is the 2nd leading cause of death among children and adolescents
- Drowning risk increases substantially at 15 years of age
- ~312 U.S. drownings per year are aged 15 to 19 years
- 69% of adolescent drowning occur in open/recreational bodies of water
- Maricopa county has 15 reservoirs and lakes

DROWNING PREVENTION

- Boating safety
- Life jacket use
- CPR basics
- Know your limits and responsibilities

VOLUNTEER TO PARTICIPATE IN DROWNING PREVENTION PROGRAM

- We will be participating in a free adolescent water safety intervention research in your High School PE class

IN THE EVENT OF AN EMERGENCY CALL **911**

www.daisymountainfire.org

APPENDIX H:

PARENTAL CONSENT FORM

The University of Arizona Parental Permission For Child's Participation in Research

Study Title: Acceptability and Feasibility of a Water Safety Intervention for Adolescents Aged 14-19 Years

Principal Investigator: Wendy Borgersen, MSN, NP

This is a parental permission form for research participation.
It contains important information about this study and what to expect if you permit your child to participate. Please consider the information carefully. Feel free to discuss the study with your friends and family and to ask questions before making your decision whether or not to permit your child to participate.

Participation is completely voluntary. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled, and you may discontinue participation at any time without penalty or loss of benefits.

Why is this study being done?

The study is conducted to test the effects and feasibility of an adolescent water safety intervention in reducing unintentional recreational drowning in adolescents.

How many people will take part in this study?

Up to 50 students will be included in this study.

What will happen if my child takes part in this study?

Your local fire department and PE teacher will provide an open water safety video for adolescents. Your child will be asked to fill out a survey before and after the video. The survey will assist in determining a change in water safety knowledge, providing insight to future feasibility for continuing a water safety intervention for adolescents.

How long will my child be in the study?

The study will be conducted during your child's routinely scheduled PE class, and will last approximately 1 hour and5 minutes.

Can my child stop being in the study?

Your child's participation is voluntary. You or your child may refuse participation in this study. If your child takes part in the study, you or your child may decide to leave the study at any time. No matter what decision you make, there will be no penalty to your child and neither you nor your child will lose any of

your usual benefits. Your decision will not affect your future relationship with Boulder Creek High School or The University of Arizona.

What risks, side effects or discomforts can my child expect from being in the study?

The study poses no more than minimal risk. The child may experience boredom, stress and fatigue.

What benefits can my child expect from being in the study?

Benefits include increased open water safety knowledge.

Will my child's study-related information be kept private?

Efforts will be made to keep your child's study-related information confidential. Your child's records may be reviewed by the following groups:

Office for Human Research Protections or other federal, state, or international regulatory agencies

The University of Arizona Institutional Review Board or Office of Responsible

What are the costs of taking part in this study?

Aside from your child's time, there are no costs for taking part in the study.

Will I or my child be paid for taking part in this study?

He or she will receive a $10 retail gift card

What are my child's rights if s/he takes part in this study?

If you and your child choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights your child may have as a participant in this study. You and your child will be provided with any new information that develops during the course of the research that may affect your decision whether or not to continue participation in the study. You or your child may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. An Institutional Review Board responsible for human subjects research at The University of Arizona reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

Who can answer my questions about the study?

For questions, concerns, or complaints about the study you may contact the Principle Investigator, Wendy Borgersen, MSN, NP at (520)395-5340.

For questions about your child's rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact the Human Subjects Protection Program at 520-626-6721 or https://rgw.arizona.edu/compliance/human-subjects-protection-program .

Signing the parental permission form

I have read (or someone has read to me) this form and I am aware that I am being asked to provide permission for my child to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to permit my child to participate in this study. I am not giving up any legal rights by signing this form.

_____
Printed name of subject

_____
Signature of subject

_____
Printed name of person authorized to provide permission for subject

_____
Signature of person authorized to provide permission for subject

_____
Relationship to the subject

_____
Date

APPENDIX I:

STUDENT ASSENT FORM

The University of Arizona Parental Permission For Your Participation in Research
Study Title: Acceptability and Feasibility of a Water Safety Intervention for Adolescents Aged 14-19 Years
Principal Investigator: Wendy Borgersen, MSN, NP

This is a permission form for research participation.
It contains important information about this study and what to expect if you decide to participate. Please consider the information carefully. Feel free to discuss the study with your friends and family and to ask questions before making your decision.
Participation is completely voluntary. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled, and you may discontinue participation at any time without penalty or loss of benefits.
Why is this study being done?

The study is conducted to test the effects and feasibility of an adolescent water safety intervention in reducing unintentional recreational drowning in adolescents.

How many people will take part in this study?
Up to 50 students will be included in this study.

What will happen if I take part in this study?
Your local fire department and PE teacher will provide an open water safety video for adolescents. You will be asked to fill out a survey before and after the video. The survey will assist in determining a change in water safety knowledge, providing insight to future feasibility for continuing a water safety intervention for adolescents.

How long will I be in the study?
The study will be conducted during your routinely scheduled PE class, and will last approximately 1 hour and 5 minutes.

Can I stop being in the study?
Your participation is voluntary. You may refuse participation in this study. If you take part in the study, you may decide to leave the study at any time. No matter what decision you make, there will be no penalty to you and neither will you lose any of your usual benefits. Your decision will not affect your future relationship with Boulder Creek High School or The University of Arizona.

What risks, side effects or discomforts can I expect from being in the study?
The study poses no more than minimal risk. You may experience boredom, stress and fatigue.

What benefits can I expect from being in the study?
Benefits include increased open water safety knowledge.

Will my study-related information be kept private?

Efforts will be made to keep your study-related information confidential. Your records may be reviewed by the following groups:
Office for Human Research Protections or other federal, state, or international regulatory agencies
The University of Arizona Institutional Review Board or Office of Responsible

What are the costs of taking part in this study?
Aside from your time, there are no costs for taking part in the study.

Will I be paid for taking part in this study?
You will receive a $10 retail gift card

What are my rights if s/he takes part in this study?
If you choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights you may have as a participant in this study. You will be provided with any new information that develops during the course of the research that may affect your decision whether or not to continue participation in the study. You may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. An Institutional Review Board responsible for human subjects research at The University of Arizona reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

Who can answer my questions about the study?
For questions, concerns, or complaints about the study you may contact the Principle Investigator, Wendy Borgersen, MSN, NP at (520)395-5340.

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact the Human Subjects Protection Program at 520-626-6721 or
https://rgw.arizona.edu/compliance/human-subjects-protection-program

I have read (or someone has read to me) this form and I am aware that I am being asked to provide permission to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study. I am not giving up any legal rights by signing this form.

_____
Printed name of subject

_____
Signature of subject Date

APPENDIX J:

WEB LINK TO PROMOTIONAL VIDEO

Web link to promotional video

https://drive.google.com/file/d/1Qwz3LHomyvrqrWiLC9ybk2W-NmBRFULV/view

APPENDIX K:

PROMOTIONAL VIDEO SCRIPT

Introduction:

"After cliff jumping into the water at Lake Powell, Eric resurfaced but because of the high waves and intense winds he couldn't swim. A private boat on the lake tried to help but weren't able to rescue Eric. His body was found by the Glen Canyon National Recreation Area Dive Team less than 24 hours later."

"The hardest part about this young man's death, is that **it is completely preventable had he known the actions that he could have taken to prevent his passing**."

"**Everyday, ten people drown. That's 3,650 people per year** who's lives are taken in the water. This generation has the ability to change that statistic and all it takes is learning five prevention measures."

"The number one primary prevention starts right where you would imagine-*swimming.* Learning to swim is vital and has the potential to save your life."

"The basics of swimming lie in treading water and the ability to float. **To tread water**, start with your body vertical in the water and head above the surface. Use your arms and legs to keep yourself afloat. Start with your arms in front of you creating a horizontal triangle that's a few inches underneath the surface of the water. Open your arms out to he side and bring them back in, continuing this motion. Simultaneously you will kick your legs back and forth at a leisurely pace. These two movements will keep you afloat. Treading water can expend a massive amount of energy in a short period of time. If you realize that you are in a water situation where you will not be rescued for a longer period of time, you want to start to float."

"**To float**, start in the position of standing or the body alignment of treading water. Slowly lay back into the water as if you were to lay in a bed. Once your body is all the way back, focus on your torso inhaling and exhaling. Bring your arms to out in a T shape and your legs forward in front of you as if you were laying in a bed. Keep your focus on the air coming into your torso and remain relaxed. Floating expends minimal energy but you must

remain aware of your surroundings as you are going to move with the motion of the body of water that you are in."

"If you find yourself in trouble, it is vital to first assess the situation. You want to figure out the most strategical swimming technique for your survival. If you know that help might not be able to rescue your for a long period of time (fifteen plus minutes) it is crucial to float. Floating will save the energy expenditure of your body and keep you alive for longer, versus if you continuously tread water and tire your muscles out."

"Remember to assess, then act."

"Treading water and floating are going to be the easiest forms of swimming safety for people in good physical shape. For those with **underlying health conditions**, you must assess the swimming situation in direct correlation to your ability to survive in those water conditions."

"Cardiac, pulmonary, or muscular disorders will effect your ability to swim for longer periods of time and to swim in harsher conditions (like strong waves or riptides). Avoid getting into waters that you are not absolutely certain that you can physically handle."

"Swimming in open water comes with multiple risk factors. Factors that could cause serious injuries are: failed depth perception, water temperature, weather, murky water and inaccessibility to emergency services. Unlike a pool, **there is no way to judge how deep open water is**. This is how most cliff jumping injuries and deaths occur as people think that it is safe to jump and find themselves injured and incapable of swimming while also being exposed to the elements of open water."

"On top of depth perception problems, oceans and lakes tend to spend more times out of the year being colder than warmer. **What happens when you jump into water that is 41 degrees Fahrenheit?** It's called a cold shock response and it's named that for a reason. Immediately after submerging oneself into 41 degree water, you will immediately start to hyperventilate. Your breathing will be uncontrollably very fast and deep for one to three

minutes and you'll have a maximum of twenty minutes before your body starts to move all of your blood towards your core in order to keep your organs warm and functioning. This movement of blood will cause your muscles to become weak and inevitably lose coordination and creates a massive risk of drowning."

"**Being aware of the weather and it's effects on the open water that you plan to swim in can save your life**. Weather effects more than just water temperature. Storms can cause massive waves in the ocean, increase the strength of riptides and make swimming in a place that is normally calm and easy to swim in, difficult and extraordinarily dangerous. In lakes, water can become extremely choppy and the current can become stronger. Jumping into the water might lead to you being pulled downstream faster than you are able to swim back to your boat. Checking the weather conditions of the open water that you plan to spend your day on takes less than two minutes and can be the difference between a great experience or a terrible one."

"**Another major risk of open water is visibility**. In pools you can see to the bottom, in open water that is not the case. Jumping in to murky water is leaping into the unknown. Underwater obstructions like rocks and dead branches can cause fatal injuries that could easily be avoided."

"It's obviously not possible for lifeguards and attendants to be everywhere. This means that when you're jumping off of a boat into the middle of a lake or ocean, swimming at a beach or without a lifeguard or tubing with friends on the lake you're putting your life into the people around you. We'll touch on the basics of CPR later but for now it's important to realize the risk that comes with swimming in open water without a trained professional. Inaccessibility to emergency services that could save the life of somebody injured in the ocean or a lake can mean a fatal incident. That fatal accident could have been avoided by having access to the emergency treatment that would save their life."

"When you get on a boat heading out into the ocean or a lake, think of it like getting on an airplane. Before take off, what does the flight attendant ask you to do? Take note of the emergency exits. The same goes for boating on open water. 84% of fatal boating accident

victims were not wearing a life jacket. **Take note of the location of life jackets and flotation devices**. What does taking note of these things now mean for the future? If a dangerous situation arises, you are one step ahead in being able to save somebodies life or in somebody being able to save your own. Bring this practice of awareness for safety equipment right to your public, friend's or family's pool."

"To get a good grasp on your physical abilities, it is best to test out your ability to tread water and float in a pool. Why? Because pools have stagnant water. Without waves, riptides, boats, jet skis or other potentially harmful situations a pool provides the opportunity to understand how good of a swimmer you are and what kind of water conditions you need to avoid.

Despite being able to avoid the elements of open water, pools are not the perfect fix. Unusual dives and tricks like backflips and gainers are the leading cause of 16.8% of **diving accidents**. Most diving accidents don't even involve a diving board but are a direct result of running too closely to a pools edge and misjudged distances."

"What happens when you become unconscious while underwater? You brain starts to lose oxygen. Think of oxygen as your body's cell phone service. You need it in order to keep working. Without cell service or a wifi connection, you can't send messages, go on social media or make calls. Your body works the same way. Without oxygen, your heart can't beat, your organs can't function and your brain cells die."

"The difference between your body and your phone is that the damage caused by lack of oxygen is permanent. You can always find a cell phone connection and your phone will perform exactly the same way that it did before you lost service."

"Your brain, doesn't work that way. It takes four minutes of oxygen deprivation before brain cells being to die. In those four minutes, the damage caused to your brain cannot be fixed. When you resume consciousness, your brain will have suffered permanent damage that cannot be fixed simply by breathing in more oxygen."

"Avoiding going "offline" with your brain is as simple as practicing diving safety while in a pool. Only dive into pools specifically designed for diving and that you feel comfortable doing so in. Do not dive in water less than eight feet."

"What is the best way to make sure that you are preventing injury or fatality when swimming?"

"**Telling people where you are**. Your parents or guardians want to be accountable for you, let them. When somebody knows where you are going to be and that you'll be swimming, you immediately have a person who has tabs on your safety. Create a system for checking in with them that allows you to have your freedom but also ensures that somebody is aware that you are safe. Checking in half way through and then on your way home immediately tells your person that you are safe. What if something unexpected happens and you need return back to land? If nobody knows where you were, there is no way for them to alert personal and get to you in time to save your life. With a person on land that can access emergency personnel to help you incase you are in a dangerous situation, you guarantee the survival of your friends and yourself."

"Having a buddy on land that knows your general timeline is important but **having another buddy in the water with you is even better**. Think of the buddy system. Each person has a buddy who they are in charge of keeping tabs on. That buddy will be the first to alert your friends if you go missing or are having any trouble swimming. Having a buddy is especially crucial in open water where the elements aren't always working in your favor. Nobody wants to FOMO, everybody grab a buddy so you can fully enjoy your time on the water."

"**If one of your peers is driving their personal watercraft, it's important to have an adult present**. What does an adult have that your friend doesn't? Experience. That experience is what will help the adult make quick decisions that an adolescent cannot. Those quick decisions could help you avoid a huge branch in the water that could flip your boat, an unexpected buoy, people swimming and other dangerous situations that occur when boating in populated areas. By learning from the experience of an adult, teenagers can become skilled boat drivers as they accumulate years of experience in open water. Having

an adult present is the best way to become a better boat driver and for those not driving but just enjoying the boat to learn the basics of boating and the only way to fully enjoy a safe day on the lake or in the ocean."

"The three major risk behaviors of injuries and death associated with water all involve social antics, including alcohol, peer pressure and cliff jumping.

"A group of friends were partying at the pool of my hotel, when one of them decided to swim 20 lengths of the pool for a bet. I saw the whole thing happen. Unfortunately, he didn't make it out of the water alive."

Up to 70% of people who drown during recreational water activities had alcohol in their system at the time of death. Why don't alcohol and swimming mix?

"**Alcohol impairs your senses**. Let's think back to your cellphone. Your phone can have a strong connection to service or a poor connection. Alcohol creates a poor connection. Your phone will consistently struggle to try to get connection but because you're not near a service tower it's not possible. That poor connection happens in your body when you consumer alcohol. As much as your brain wants to tell your arms and legs to swim, there's something blocking that connection and the message has trouble getting from your brain to your body. This disorientation and confusion can be extremely dangerous when on land, now imagine having this problem while swimming. On top of disorientation and inability to properly swim, your sense of distance and direction will be altered which leaves you totally vulnerable to changing currents in the ocean or a river. Drinking alcohol and jumping into water is like taking a bet against your own survival, a bet that 70% of drowning victims suffered the consequences of."

"As tempting as it is to fit in and to drink, succumbing to **peer pressure** can mean life or death. If you find yourself in a situation where you are having trouble saying no, tell your peers that drinking isn't your thing. The people who can say no to antics that they don't believe in or feel comfortable with are always the ones that go on to change the world in a

positive manner. Be proud of being able to say no and having a positive influence on those around you."

"One of the most peer pressured risky behaviors is **cliff jumping**. Here is the problem with jumping off cliffs into lakes or oceans, the amount of unknown factors. Somebody could jump right before you and land safely into the water. You happen to jump three steps to the right and hit a massive rock. As soon as you hit that rock and become injured, your ability to swim is going to be severely if not totally impaired. Start the clock, your four minutes is ticking down. That jump will be the difference between living a normal life or potentially becoming handicapped or losing your life. Is it worth the risk?"

"Anytime you find yourself in a situation with open water, you run a risk. Boats can be a completely safe experience when the person driving is a responsible adult with enough past experience to maneuver around any potential hazards. If you plan to operate a personal watercraft, taking a **boat safety** course and attaining your boating license is the law, for a reason. During a boat safety course, you learn about the logistics of boating including how you must display lights, speed restrictions, carry capacity, how to read regulatory markers, diver flags and more."

"Operation inexperience, inattentiveness, improper lookout, machinery failure and excessive speed rank as the top five factors for boating accidents where 71% of the deaths were caused by victims drowning."

"A responsible driver is the first step. **Driving a vehicle or boat under the influence of drugs and alcohol** is illegal and will send you to jail as well as give you a criminal record and a fine of $2,500. The consequences of a criminal record can be issues with getting jobs, living in apartments, and more."

The second step of boat safety is that as a watercraft owner you must be aware that boats are just like cars. Cars are not designed to be driven for a year without ever having the oil changed or looking underneath the hood. They need to be tuned and checked on a regular basis to make sure that they are safe to operate. The same goes for boats. **Each vessel**

should be checked often for mechanical and structural issues as well as safety equipment like **life vests and flotation devices**. These checks are what ensure that the watercraft is a safe option to have on the water for both those on the boat and the people in boats and the water surrounding it."

"Having **orange flags** for use as a swimmer on a populated lake is not a law but will also help to attract other boat drivers attention to where you are swimming. This will avoid fatal collisions and accidents. Other flags that you'll see in the water are those to indicate divers. **Diver flags** are a red flag with a single white diagonal stripe from the staff head to the lower corner and tell boat drivers that there is a diver submerged at that location. "

"An important part of a properly operating boat is having a **carbon monoxide detector.** Young adults were sitting on the back of idling boat when they lost consciousness spontaneously and fell into the water. Cause of death was found to be drowning directly correlated to a loss of consciousness due to the carbon monoxide coming from the idling boat's exhaust fumes."

"Unfortunately, the other people on the boat were not aware of the signs of carbon monoxide poisoning and were unable to save their friends. Symptoms include a dull headache, weakness, dizziness, nausea or vomiting, shortness of breath, confusion, blurred vision and loss of consciousness. To immediately help somebody suffering from carbon monoxide poisoning, get the victim into fresh air as far away from the source of carbon monoxide as possible. Call 911 or emergency help."

"In an accident that occurs in water, you want to make sure that you are thinking strategically for both the victims and your own survival. Getting yourself and the victim before attempting any life saving procedures is vital. This means bringing them to shore or to a safe place where both you and the victim are out of the water and harms way."

"Immediate treatment after any water related injury is the best way to make sure that the victim survives. For this reason, medical personal around the globe stress the importance of knowing how to perform CPR. Aside from calling 911 as quickly as possible or alerting

nearby medical staff of an accident, CPR is going to be a valuable part of saving your friends, siblings, parent or strangers life."

"**Here are the three steps of CPR**:

First, you want to check the victim for unresponsiveness. Unresponsiveness can be categorized as not breathing or not breathing normally.

If the victim is not breathing, coughing or moving, you are going to perform step two of CPR: chest compressions. Push down in the center of the chest two to two point four inches thirty times. You want to pump hard and fast at the rate of one hundred to one hundred pumps per minute. This is going to be faster than one pump per second. To help you achieve the right amount of compressions, think of the song "Stayin' Alive." With one hundred and three beats per minute, pumping compressions on each beat is a good way to make sure that you are providing compressions quickly enough.

Step three of CPR is to provide oxygen. Tilt the victims head back, lift the chin, pinch their nose and cover their mouth with yours. Blow until you see their chest rise. Give two total breaths each for about one second.

Continue steps two and three, pumping thirty times then blowing two breaths into the victim's lungs and repeating until help arrives."

"CPR is not just a crucial part of water safety but is also a VIP player in fire safety.

"The Phoenix Fire Department urges you to go through a fire safety checklist in order to avoid any catastrophic events where CPR might be necessary to save somebody's life."

"There are seven steps to fire safety:

One: Replacing batteries smoke detectors and other test devices, like carbon monoxide detectors. Count on replacing the batteries once a year.

Two: Replace old smoke detectors. If a smoke detector in your house is more than ten years old, for your safety is necessary to replace it with a new one.

Three: Install fire extinguishers in the kitchen, workshop and garage. The best fire extinguisher to have handy is an ABC extinguisher designed to handle household fires from paper, grease and electrical shorts. Make sure to keep the extinguisher in an easy to access place and that everybody in the house knows where it is located.

Four: Inspect storage containers. Gas leakages inside of storage containers can cause fires, especially with containers that have been consistently scraping on concrete or house small gas engine power equipment.

Five: Be safe with extension cords. What most users don't know is that extension cords can become worn out easily. The copper conductors inside of the cord undergo a hardening process after being consistently bent, wherever this is a hardening a hot spot forms and can catch fire to nearby flammable objects. For that reason you should never an extension cord underneath rug or stapled to wall.

Six: Discard of oily shop rags in a steel waste container or hang them to dry an dispose of them as soon as possible.

Seven: Remove anything near a combustion appliance like a water heater, furnace or boiler. These appliances need air to flow to them and around them, placing boxes or paper nearby could cause a serious fire."

"Remember that water safety and fire safety is in your hands. You can prevent most accidents from happening simply by being aware of the consequences of risky behavior."

"If you want to improve your swim strength in order to be able to be as safe as possible in open water, you can take lessons at Bolle Adult Swim School. They can be reached at 602-323-4116.

"For resources regarding boating safety, you can find answers to your questions at **http://www.azgfd.gov/pdfs/outdoor_recreation/boating_laws.pdf** as well as contact boating officials at 602-942-3000.

"You can register for a CPR course at the American Red Cross in Phoenix by calling 602-336-6660."

"To learn more about water safety, you can visit the Phoenix Fire Department's water safety suggestions at: https://www.phoenix.gov/fire/safety-information/home/water"

Resources:

Intro Story: http://www.azcentral.com/story/news/local/arizona-breaking/2017/08/15/arizona-man-dies-after-cliff-jumping-lake-powell/570630001/

Water temperature; https://www.scientificamerican.com/article/airplane-1549-hudson-hypothermia/

Diving Statistics: https://www.swoperodante.com/pools-and-diving-accidents-injury-statistics/
Do not dive into water less than eight feet:
https://www.health.ny.gov/.../minimum_water_depths_for_head_first_diving.htm

Drowning and alcohol in system statistic:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1730083/

Alcohol and drowning hotel story and impairment: https://www.rehab-treatment.co.uk/news/alcohol-dangers-drinking-swimming-mix/

Boat Accident Statistics: commanderbob.com/cbstats.html

CPR: http://depts.washington.edu/learncpr/quickcpr.html

REFERENCES

American Association of Colleges of Nurses. (2006). *The essentials of doctoral education for advanced nursing practice*. Retrieved February 3, 2019 from https://www.aacnnursing.org/Portals/42/Publications/DNPEssentials.pdf

American Psychological Association. (2016). *Developing adolescents: A reference for professionals*. Retrieved December 12, 2016 from http://www.apa.org/pubs/info/brochures/develop.aspx

Arizona Department of Health Services. (2014). *Water-related incidents in Maricopa county, 2013*. Retrieved September 24, 2015 from http://www.azdhs.gov/documents/preparedness/public-health-statistics/publications/water-related-incidents-maricopa-county-2013.pdf

Austin, S. & Macintosh, I. (2013). Management of drowning in children. *Pediatric and Child Health*, 23, 397-401.

Balint, V. L. (2011). *Danger on the open water*. Retrieved September 25, 2015 from https://www.raisingarizonakids.com/2011/05/danger-on-the-open-water/

Bandura, A. (2004). Health promotion by social cognitive means. *Health Education and Behavior*, *31*, 143-164.

Bandura, A. (1989). Organizational application of social cognitive theory. *Australian Journal of Management*, *13*(2), 275-302.

Beattie, N., Shaw, P., & Larson, A. (2008). Water safety in the bush: Strategies for addressing training needs in remote areas. *Rural and Remote Health, 8*, 855.

Benett, E., Cummings, P., Quan, L., & Lewis, F. M. (1999). Evaluation of a drowning prevention campaign in King County, Washington. *Injury Prevention, 5*, 109-113.

Borgersen, W. L. (2014). *Improving autonomous symptom management intervention for children with cancer*. Unpublished manuscript, University of Arizona.

Borgersen, W. L. (2013). *Improving autonomous symptom management intervention for children with cancer: Application of the social cognitive theory*. Unpublished manuscript, University of Arizona.

Bowen, D. J., Kreuter, M., Spring, B., Cofta-Woerpel, L., Linnan, L., Weiner, D., … Fernandez, M. (2009). How we design feasibility studies. *American Journal of Preventative Medicine, 36*, 452-457.

Brenner, R. A. (2003). Prevention of drowning in infants, children, and adolescents. *Pediatrics, 112*, 440-445.

Brenner, R. A., Taneja, G. S., Haynie, D. L., Trumble, A. C., Qian, C., Klinger, R. M., & Klebanoff, M. A. (2009). Association between swimming lessons and drowning in childhood: A case-control study. *Archives of Pediatric and Adolescent Medicine, 163*, 203-210.

Carl, R., Leo, H., & Cox, E. (2001). Recreational water safety in Wisconsin. *Wisconsin Medical Journal, 100*, 43-46.

Centers for Disease Control and Prevention. (2012). *Drowning risks in natural water settings.* Retrieved September 24, 2015 from http://www.cdc.gov/features/dsdrowningrisks/

Centers for Disease Control and Prevention. (2016). *Unintentional drowning: Get the facts*. Retrieved May 3, 2016 from http://www.cdc.gov/homeandrecreationalsafety/water-safety/waterinjuries-factsheet.html

Davis, D. F. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*, 319-339.

Davoudi-Kiakalayeh, A., Mohammadi, R., Yousefzade-Chabok, S., & Jansson, B. (2012). Evaluation of a community-based drowning prevention programme in northern Islamic Republic of Iran. *Eastern Mediterranean Health Journal, 19*, 629-637.

Denny, S. A., Quan, L., Gilchrist, J., McCallin, T., Shenoi, R., & Yusuf, S. (2019). Prevention of drowning. *Pediatrics*, e20190850. doi:10.1542/peds.2019-0850

Dewar, D. L., Lubans, D. R., Plotnikoff, R. C., & Morgan, P. J. (2012). Development and evaluation of social cognitive measures related to adolescent dietary behaviors. *International Journal of Behavioral Nutrition and Physical Activity, 9*, 36.

Fisher, J. D. & Fisher, W. A. (2000). Theoretical approaches to individual-level change in HIV risk behavior. *Handbook of HIV Prevention*, 3-55.

Inland Empire Swimming. (n.d.) *Water safety for teens 12 to 18 years*. Retrieved November 11, 2016 from http://www.ieswim.org/wzielsc/UserFiles/File/Water%20Safety%20for%20Teens%2012%20to%2018%20Years%5B2%5D(1).pdf

Kline, R. B. (2005), *Principles and practice of structural equation modeling* (2nd ed.). New York, NY: The Guilford Press.

Lau, W. P., Lau, E. Y., Wong, D., & Randsell, L. (2011). A systematic review of information and communication technology-based interventions for promoting physical activity behavior change in children and adolescents. *Journal of Medical Internet Research, 13*, 48-56.

Lawson, K. A., Duzinski, S. V., Wheeler, T., Yuma-Guerrero, P. J., Johnson, K. M., Todd Maxson, R., & Schlechter, R. (2012). Teaching safety at a summer camp: Evaluation of a water safety curriculum in an urban community setting. *Health Promotion Practice, 13*, 835-841.

Leavy, J. E., Crawford, G., Portsmouth, L. Jancey, J., Leaversuch, F., Nimmo, L., & Hunt, K. (2015). Recreational drowning prevention interventions for adults, 1990-2012: A review. *J Community Health, 40*(4), 725-735. https://doi.org/10.1007/s10900-015-9991-6

Mastrian, K. G., McGonigle, D., Mahan, W. L., & Bixler, B. (2011). *Integrating technology in nursing education: Tools for the knowledge era*. Sudbury, MA: Jones and Bartlett Publishers.

Meleis, A. I. (2007) *Theoretical nursing: Development & progress* (4th ed.), Philadelphia, PA: Lippincott Williams & Wilkins.

Moran, K. (2006). *Re-thinking drowning risk: The role of water safety knowledge, attitudes, and behaviors in the aquatic recreation of New Zealand youth*. Retrieved from The University of Auckland New Zealand: http://mro.massey.ac.nz/bitstream/handle/10179/642/02whole.pdf?sequence=1

Petrass, L. A. & Blitvich, J. D. (2014). Preventing adolescent drowning: Understanding water safety knowledge, attitudes and swimming ability. The effect of a short water safety intervention. *Accident Analysis and Prevention, 70*, 188-194.

Piaget, J. (1952). *The origins of intelligence in children* (Ed.). New York, NY: International Universities Press.

Polit D. F. & Tatano Beck, C. (2014) *Essentials of nursing research: Appraising evidence for nursing practice* (Ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

Prasad, P. (2005). *Crafting qualitative research: Working in the postpositivist traditions* (Ed.). Armonk, NY: M.E. Sharpe, Inc.

PRISMA. (2015). *Transparent reporting of systematic reviews and meta-analyses*. Retrieved February 5, 2016 from http://prisma-statement.org/PRISMAStatement/CitingAndUsingPRISMA.aspx

Rahman, F., Bose, S., Linnan, M., Rahman, A., Mashreky, S. Haaland, B., & Finkelstein, E. (2012). Cost-effectiveness of an injury and drowning prevention program in Bangladesh. *Pediatrics, 130,* 1621-1628.

Saade, R. & Bahli, B. (2005). The impact of cognitive absorption on perceived usefulness and perceived ease of use in on-line learning an extension of the technology acceptance model. *Information & Management, 42,* 317-327.

Sanders, R. A. (2013). Adolescent psychosocial, social, and cognitive development. *Pediatrics in Review, 34,* 354-358.

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Belmont, CA: Wadsworth.

Shen, J., Pang, S., & Schwebel, D. C. (2016). Evaluation of a drowning prevention program based on testimonial videos: A randomized controlled trial. *Journal of Pediatric Psychology, 41*(5), 555-565. Retrieved from https://doi.org/10.1093/jpepsy/jsv104

Simons-Morton B., McLeroy K. R., & Wendel, M. L. (2012). *Behavior theory in health promotion practice and research* (Ed.). Burlington, MA: Jones & Bartlett Learning.

Soloman, R., Giganti, M. J., Weiner, A., & Akpinar-Elci, M. (2012). Water safety education among primary school children in Grenada. *International Journal of Injury Control and Safety Promotion, 20,* 266-270.

Terzidis, A., Koutroumpa, A., Skalkidis, I., Matzavakis, I., Malliori, M., Frangakis, C. E., DiScala, C., & Petridou, E. T. (2007). Water safety: Age-specific changes in knowledge and attitudes following a school-based intervention. *Injury Prevention, 13,* 120-124.

Trochim, W. M. (2006). *The research methods knowledge base* (Ed.). Retrieved from http://www.socialresearchmethods.net/kb/

Wallis, B. A., Watt, K., Franklin, R. C., Taylor, M., Nixon, J. W, & Kimble, (2015). Interventions associated with drowning prevention in children and adolescents: Systematic literature review. *Injury Prevention, 21,* 195-204.

Wallis, B. A., Watt, K., Franklin, R. C., & Kimble, R. M. (2015b). Drowning in aboriginal and Torres Strait islander children and adolescents in Queensland (Australia). *BMC Public Health, 15*(1). doi:10.1186/s12889-015-2137-z

Weiss, J. (2010). Technical report – Prevention of drowning. *American Academy of Pediatrics, 126,* 253-262.